

HOME COMPUTING WEEKLY

AN ADAMS SPECIALIST PUBLICATION

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Sony Hit Bit review



Exclusive reviews!

Superior's latest Alligator's latest Blogger



Princess III at the Daily Mail Ideal Home exhibition

Helping hand from Seiko

A wrist-held terminal, is the latest gadget from Seiko. The terminal is fitted with a watch case and is capable of giving up to 80 screens of information.

The screen can be incorporated in a telephone number, alarm strings — or even information for checking a train.

At the moment only C&A software is supplied with the wrist terminal but A & P has been commissioned to write versions for Sinclair and Acorn. These are expected to be ready by the April release date.

The watch is graphically presented on your computer screen and you load information into the 2K (minimum) memory. The connecting cable plugs into the rear port of the C&A.

The unit also functions as a watch, an alarm and gives worldwide time checks. Its display is made up of a liquid crystal unit with two lines of 12 characters.

Software is supplied on both cassette and disc. The price is yet to be decided. A Seiko spokesman commented "We expect this to be about £150".

However, it's an expensive way to do what is simple.

HCW will be reviewing the wrist terminal in the near future.



Sinclair send-up

April Fool's Day is still some weeks away, yet Harrison has just released a spoof game based around the life of the man behind the ZX.

A Day in the Life follows the progress of a hounded, harassed character who is on his way to the Palace to be dubbed "Duke Commander of the British Empire".

The game features Sir Clive's house, his journey to the station and even a visit to the barber, where the scissors clip and the famous beard is lost.

The Sinclair ZX game is an appearance, but Sir Clive doesn't rule it at any stage.

Sir Clive was unavailable for comment so we went to press but our interview has made his comments inside this week's HCW.

Paying bills in comfort

Princess Diana gave the royal seal of approval to the Daily Mail Ideal Home exhibition in Park Court, where Prindle was demonstrating the new features.

Now you can pay your bills and order — and pay for — computer equipment using your computer and Prindle.

The Bank of Scotland is the first bank to set up a home banking system. Account holders can pay bills, call on policies and statements and check funds from one account to another, through Prindle.

Available for 17 hours a day — 15 at weekends — the service is aimed at both home and business users. And according to Maurice McCallie at the Daily Mail Ideal Home exhibition, the response so far has been tremendous. "You don't have to be near a Bank of

Scotland branch to make use of the facilities," she said.

And security isn't a problem according to his McCallie. "You need four separate codes to access the information. They are a combination of letters and figures, upper and lower case, so there's something like 200 billion combinations. We feel quite secure about it, after extensive testing."

Lindwoods has also combined with Prindle to produce Shop TV. Customers can order electrical equipment at competitive prices and have it delivered within 14 days. Arrivals and Commando machines and add-ons are available, and payment is by credit card.

"Lindwoods is very keen to develop this service and it's very much a thing of the future," said Anne Isaacs of Lindwoods.

Our screen from A Day in the Life



Inside your bolder, brighter, better HCW

Pull-out jargon guide Don't be baffled!

Explode your BBC's characters

Worms Wipers Special offer cassette labels

Give your Amstrad the gift of the gab

Rhyme Land

An entertaining educational game where children can develop their skills of logic and deduction, improve their reading and spelling, and at the same time have tremendous fun. Explore country paths, fields, woods and other pleasant places, where you will encounter many interesting characters, such as the Crooked Man, Little Bo-Peep, and discover hidden objects, which you will need in order to help these nursery rhyme characters. For example, you must fetch water for Jack and Jill, and can help the Crooked Man by looking for his axe.

There are thirty-three locations to explore, many having colourful graphics and amusing sound effects. The game has a large vocabulary and a spelling is guaranteed correct. Age 5 and above.

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Devilish modem

Those who have been reading the news for a few months will have heard all about the Unicom Modem. It's available now and has appeared under a new name.

The Deviant Modem, priced at a devilish £49.95, has two dial, auto answer half and full duplex facilities. Has included in the price is the software which you need in order to access the major databases.

MAC software is already available on ROM 911-023

including a user built facility, printer receiving and remote connections. Software for Macintosh, Amstrad, Commodore and London is due for release next month.

Anyone using a Deviant in this country is likely to have a tale of British Telecom. Deviant. The modem isn't yet approved for connection to the public network. This official approval is expected before the end of the month.

Southworth Sales, 28 Orange St, London WC2



Deviant a Deviant

Sparkling new range

Creative Sparks, publisher of Macbeth and Dragon Mount, is to release a new budget range of games under the banner Sparkies.

The games, set due for release until April, will cost £2.50 each and are being produced to make some of the games which have been submitted to the company by amateur writers.

Steady Macintosh, Creative Sparks's home computer software manager, claimed: "Few people don't need to mean low quality. With Sparkies we will prove that you can offer good playable games with nice graphics and still charge only £2.50."

First releases will include games for the Spectrum, Commodore 64, VIC-20 and other popular machines.

Creative Sparks, Thomson Hse, 29A Pennington Rd, Hendonburgh, Merseyside L24 8AF

Magic price

Security, one of the games chosen for the Best And Spookiest award, has cost a good one in its players. One of them has recently cost a lot, to the tune of £10.

Julia Rafter, who won a C&A Award for the holiday between Headbangers. This information wasn't used to prove for other players, as the graphics really are quite amazing.

Mr M's, reading an official statement on security like C&A 4-4. We remember his will remember when many kids are shown a wonderful device. It certainly cost a spell over him.

Witch's Missing Deviant, Nick Alexander, agreed considering that the game was worth mentioning for the Award. It has sold 25,000 several versions to date and Nick is reported to be using a large entry fee.

Witch Games, 3-4 Vauxhall Yard, Portland St, London W11 3JF



Bright quest programmer Dave Chapman

NEWS

RAID on BUNGELING BAY

OUT NOW ON CASSETTE & DISK

THUGS DO IT

A STEP BEYOND 'BEACH HEAD'

Those of us who love very fast and furious, especially when being attacked by jet fighters firing fast-moving missiles. It's not just the adrenaline rush. Superb graphics that will bring you to grips with USA fighters. The offensive packages and fast close encounters add up to a truly professional game.

Score History

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ariola



Warnes Wipers is offering you the chance to smarten up your cassette library with these correctable labels — at a reduced price



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D.R.

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7 million Londoners ... 943 action filled screens.

BROAD STREET

You have to watch out for blue machines, enemies and Rath! A clever strategy game, full of excitement, brilliant graphics and all wrapped up with McCartney music!



Abstract

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1. *Journal of Management Studies*, 1990, 27, 1.

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MUSIC AND THE MICRO

In the first of a regular series, James Russell looks at sound and the home computer. There's a test program for you to experiment with, too

Welcome! This regular column is designed to help you exploit the musical capabilities of your micro, wherever it is. Over the coming months, we'll be looking at how sound is programmed on different machines, reviewing music software, and, with a bit of help from you, the reader, informing and entertaining each other with tips and programs. You don't have to be an expert; you don't have to be musical; you just have to be keen.

At the simplest level, music is just sound, and sound is just a vibration of the air. The number of vibrations in one second — the frequency — makes the pitch of the note vary. As a result, rapid vibrations produce high notes and slow vibrations low notes. But notes aren't all the same length; notes of some notes last longer than others. That is the duration of the note.

If your micro supports sound from BASIC, then by installing your musical you will find, amongst all the complicated bits, a reference to both frequency/pitch, and duration/length. Perhaps the simplest is the Spectrum with

EEP duration in seconds, pitch

On more sophisticated sound machines, which have the capability to play more than one note at once, called notes or channels, you need to tell your machine which channel to use, and how long to play the note. Thus on the BBC:

SOUND channel number, frequency, pitch, duration

```

1000 REM THE
2000 REM: 2000
3000 LET tempo=5
4000 FOR n=1 TO 15
5000 READ channel, pitch
6000 GOTO channel, tempo, pitch
7000 NEXT n
8000 GOTO
9000 DATA 1 5,8,2,10,8 5,9,8 25,7,8 25,5,8 25,4
1000 DATA 2 5,3,1 5,1,1 5,8,2,12,8,8,10,8 25,8
1100 DATA 3 25,7,8,25,8,4,4
  
```

And on the Amstrad CPC:

SOUND channel number, pitch, duration, loudness

Have a look at your manual, and see what's required. Then, experiment with the listing below originated on the Spectrum. It's a short list from a well-known TV series which I wrote to accompany a magazine listing.

The variable tempo varies the speed of the tune. Play around with it and see what happens! Fifteen times, the computer flashes a pair of values from three stored up in the data statements below, the first value at each pair is the length of the note, called duration, while the second value is the frequency or pitch of the note. As the note is played, it's duration is modified by the tempo in which you want it played, then the note is played for that period of time. The whole process then starts again.

If you don't have a Spectrum, then you have a bit more work to do! Unfortunately, each micro makes harder the duration and pitch with a different set of numbers, so on the BBC the note of middle C is 25, on the Spectrum it's 0 and on the CPC400 it's 474. Fun, isn't it?

To save you hours of agony, the notes in the sequence above are:

C, A sharp, A, G, F, E, D sharp, C sharp, C, C one octave higher, A sharp, A, G, F, E

Using the tables in your manual, you should be able to

work them out from above! If any mistakes have followed on this far, I know all those things look funny, but that's how the magazine shows it!

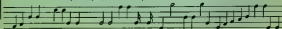
To work out the duration, look at the first number in each of the pairs of values in the Spectrum listing. That's the duration in seconds. A bit of swift multiplication should enable you to convert the your micro. Type it in and see what you get!

If you're a wad fan, you should recognise the result. If you don't then check your calculations and try again!

When you get the whole thing up and running, save a copy to tape, then play around with the values. The PGM-NEXT loop should be set for the number of notes you want to play and the DATA statements should hold enough pairs of values for each of those notes. Don't worry too much about mistakes, you'll find a reasonable value as the notes progress then have a try!

Next month, I'll be looking at some Spectrum sound software, continuing with the explanation of sound commands, and, if you put pen to paper, reporting how readers have fared with this month's offering. Not only that, but if you have some interesting program fragments rather than tape or an printer, I'd be pleased to have a look at them. And if you can recommend good music software for our micro, send in the details and we'll try to get hold of a few reviews. The address is: Music and the Micro, Home Computing Weekly, No 1 Golden Square, London W1R 3AA.

What next?



HARDWARE



Hit Hit plus all the trimmings

SONY HB-75B — IT'S A HIT

Mal Poszkowski reviews the Sony Hit Bit for HCW, and gives you his thoughts on MSX, computing and the universe

C omputers are like coming to work with a message. It comes to you full of novelty offering the promise of fresh mystery to unravel. It's easy to be blinded by it's youthful appearance, clean lines and untroubled reputation but... is it any better than what you have, or is currently available?

I suppose it must, at times, depend on the man. You must appreciate that as far as I'm concerned I have made it my business to compute machines, and I may see their faults and virtues, but to someone who is thinking of buying a computer for the first time, there are, I suspect, other priorities — like a good salesman might, for example — or the stability and reliability of the company involved — not to be underestimated in the personal domain!

But why are MSX at all? Firstly the amount of software I can't really see how these

machines can fail to be well provided — at the last count there were over 300 titles and growing — and this is simply because it's based on the Z80 CPU chip, which has been around for some time. That in itself can be a criterion of the machine because some people believe that in order to be good, a computer has to be one of the best. A load of rubbish! That may be valid in the higher reaches of the business world, but not with a home micro.

Secondly the company, or companies, as there are several involved. Toshiba, Matsushita, Sharp, Canon, NEC and Sony — is there anyone who hasn't heard of them? Reliability is guaranteed, I assume. But more important, just think of all the other electronic products these companies are producing. And when it comes to interfacing (connecting) them to the home Micro, then which one do you think they will use?

As an example look at

Toshiba, who has linked it's MSX to a mainframe, I'm particularly intrigued by the prospect of interactive laser disc games — already a reality in Japan.

But having got that out of my system, let's consider the Sony HB as an example of the current MSX machines on the market.

It's one of the more expensive in the MSX range, although prices are dropping fast due to the advantages of having so many machines using the same standard is that there is a lot of competition between them. In common with the others the Sony has MSX of kind plus a 14K video display processor (VDP) — although when you switch on you are there are only 28K15 bytes free. The red is only accessible with machine code. That is, however, also for domestic use.

Screen colours are available in four shades of screen, two text and two graphics. You can also have sprite graphics in any

of four forms, varying in size. Sprites are those independent user-defined graphics which give you superior control and movement. Excellent for games. Very comprehensive and standard on all MSX machines.

So what is different and why the range is poor? Well you have to look at the quality of production, the machine's styling and those non-standard extras.

The Sharp HB (a stand for the file and not for hard block) comes in a black case with a black QWERTY keyboard (quarter hard black is right after all) and very simple, dull and function keys. It looks good and weighs in at about 3.5 kg. That's quite heavy, but includes the built-in transceiver which makes it easier and probably safer on the desktop.

The keyboard feels good and, once I catch up, I appreciated the second click on the F and J keys to help remind to the correct home keys. Also nice was the click you could hear through your telephone on each

depression. Small things which go towards a well thought out finish.

There is a power on/off key on the raised bank, well out of the way, with no noisy flicking about out of sight. A reset button, not standard, is included just above the backspace key, but clearly reserved to avoid accidents whilst working.

Other common interfaces include using the Centronics Standard and two popular ports using native pin connectors.

A nice extra is the RGB video output socket which allows you to connect up to a monitor for the more serious work.

There are two cartridge ports on the top and the other at the back closed off with two screws. Either can be used, but not, I understand, at the same time at the moment. There are warnings about switching off before placing cartridges and it is a pity (perhaps if enough people say it) that there isn't a port under the port cover as in the Japanese

version.

Once the main selling point with the Sharp computer is the built-in disc bank facility which can be used as a magazine with the data cartridge. It is accessed on power up by selection with the sensor. Each data cartridge can hold 4K bytes, which amounts to about 30 records.

The main advantage is the speed and versatility of the system. It is operated by a full BASIC program which doesn't take up any of the available memory and offers a screen-driven search, sort and listing of files. Very easy to use.

The remote can be used on data cartridge or cassette with the ability to exchange between the two. Files can be held on cartridge even when it's removed from the machine, due to the random lithium battery which lasts up to five years. Good for domestic use, but rather expensive, since data cartridges cost £70 each.

Finally the documentation. You are provided with the introduction to MSX Basic

which, at just over 100 pages, was liberally sprinkled with programming examples, as well as a dog called Fido, who takes you through the elementary stages of setting up and inserting the more straightforward BASIC statements. There wasn't enough, I felt, and you would soon find yourself in the bookshop for more.

I think there are powerful arguments for choosing MSX both in the home and to provide a link with business schools. The Sharp HB, in an example of the sort of standard we can expect, is well built. Robust enough to cope with the demands of games players at home and efficient enough to work for a's home. With the addition of a hard disc drive and MSX-BASIC on CP/86, well... Perhaps I'll tell you about it sometime.

Microsoft was astonished to discover it over the time that I've developed the taste for better things. I'd have to consider doing the honorable thing.



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MICRO LIBRARY

A mound of books has piled up in our office that were almost all there for C&D years.

In fact, there are entire books for the Commodore machine than for all the others put together. We've got a "Beginner's Guide" of 110 pages from First Publishing, whose books in distinctive blue and yellow covers have come to those shores via both Germany and America. First glance reveals them to be very detailed introductions of the subjects and likely to be of great interest to the real beginner. One graphic comment was most impressive when he pointed into the office and took a book.

Advertisers have a great or more fun. We are constantly being told that this type of game is becoming more popular by the day and from the number of books currently available this could well be true.

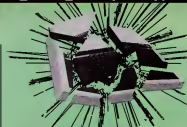
Duckworth's adventure series covers most of the popular markets and each of these books contains a full exploring of best selling adventure programs. The general book contains full details of the Hobbit and three Snow White adventures, all of which are sold for a number of machines.

But here a response to my inquiry for the TV work being published. Although the ones listed thus week are all American imports, I'm sure they will be very popular with TV fans as they're all masters of sex and violence.

We'll be featuring Book reviews on a regular basis and you can look forward to hearing more of the titles later on Fall preview.

Title	Author	Publisher	Price
Communicator 44 Books and tips for the 44 Assembly of the 44		Flex Flex	\$1.95 \$1.95
The Communicator 44 machine Language book		Flex	\$1.95
Advanced machine language for the CM		Flex	\$1.95
The Communicator 44 also book Assembly of the CM4 also drive Graphics for your 44		Flex Flex Flex	\$1.95 \$1.95 \$1.95
Computer's Communicator collection vol 1		Holt Saunders	\$19.95
Computer's Communicator collection vol 2		Holt Saunders	\$19.95
Computer's third book of Communicator 44		Holt Saunders	\$19.95
Communicator 44 compiler Hardware issues on the CM4	Lipton, Rattmann	Century	\$19.95
Communicator 44 books	Reidson Harris	Sigapore Wiley	\$19.95 \$19.95
The Communicator 44 advanced 16 bit machine code routines	Chappell	Darksworld	\$19.95
Assembly routines for the CM4 Advanced BASIC and machine code	Chappell Garnett	Darksworld Darksworld	\$19.95 \$19.95
Will you still love me when I'm 44	Garnett	Darksworld	\$19.95
VIC-44 Mapping the VIC	Computer Damon	Holt Saunders Holt Saunders	\$19.95 \$1.95
TI-99-44 Computer's TI collection vol 1 BASIC and Home Applications Thirty-three programs for the TI		Holt Saunders Flex Flex	\$19.95 \$19.95 \$19.95
TIC Setting and making projects Building tools with TIC and BASIC from	Watts	Microbooks	\$19.95
The TIC micro adventure	Jagan Chappell	Primer Darksworld	\$19.95 \$19.95
Spectrum The Spectrum computer My Spectrum computer and me	Garnett Solomon	Darksworld Darksworld	\$19.95 \$19.95
MSX MSX BASIC revealed	Palmer, Richards	Penguin	\$19.95
Amstrad Computer challenges	Hayley, Vinge	Darksworld	\$19.95
General Capital Factors Issues of computers and simple programming The software's companion		Temple Garnett, Garnett	\$19.95 \$19.95

EXPLODING THE CHARACTER SET



In the first of this series I said that only characters in the range 124 to 125 may be redefined. Since the definitions for the characters from 12 to 123 (0 to 31) are locked codes handling various things such as printer control and may not be redefined, are held in ROM (read-only memory), it would seem to be impossible to redefine them. However, those clever people at ASCII thoughtfully provided a command which allows you to redefine the whole of the character set. First you must be made for the new characters. This process is called Exploding the character set.

The character set is previously distributed as exploded. Exploding enables the user to redefine characters from 12 to 125 in steps of 12 until characters at a time. The command to do this is "EXPLODE, N" defines how much memory is to be allocated for the new characters and they are as follows.

Command Memory allocation

```

TYPE= 0000 0000 0000 0000
PAGE= 0000 0000 0000 0000
EXPLO= 0000 0000 0000 0000
TYPE= 0000 0000 0000 0000
PAGE= 0000 0000 0000 0000
EXPLO= 0000 0000 0000 0000

```

EXPLODE — operating system high water mark. This is the value to which the pointer variable PAGE is usually set to.

Using this technique, the whole character set may be redefined. Type in listing 1, which redefines it to a new Hitachi character set. Save it under the name "DEFINITE" before you run it. This type is:

```

PAGE = PAGE + 4000
( RETURN )
CHAIN "DEFINITE"
( RETURN )

```

This week Shingo Sugiura explains how to redefine the whole character set on the SBC

```

10000 Hitachi font
10001 ROM
20000 by Shingo Sugiura
40
504F020,4
60FF0200,4,4
700017H1-TECH FONT"
80000
90

```

```

110000FF0200,40,4FE,000,"0",400,400,000,40,400
120000020,40,430,000,000,000,000,000,000,000
130000070,000,0FE,000,000,0FE,000,000,000,000
140000020,00,0FE,000,000,0FE,000,000,000,000
150000020,00,000,000,000,000,000,000,000,000
160000020,00,0FE,000,000,0FE,000,000,000,000
170000020,00,0FE,000,000,0FE,000,000,000,000
180000020,00,0FE,000,000,0FE,000,000,000,000
190000020,00,0FE,000,000,0FE,000,000,000,000
200000020,00,0FE,000,000,0FE,000,000,000,000
210000020,00,0FE,000,000,0FE,000,000,000,000
220000020,00,0FE,000,000,0FE,000,000,000,000
230000020,00,0FE,000,000,0FE,000,000,000,000
240000020,00,0FE,000,000,0FE,000,000,000,000
250000020,00,0FE,000,000,0FE,000,000,000,000
260000020,00,0FE,000,000,0FE,000,000,000,000
270000020,00,0FE,000,000,0FE,000,000,000,000
280000020,00,0FE,000,000,0FE,000,000,000,000
290000020,00,0FE,000,000,0FE,000,000,000,000
300000020,00,0FE,000,000,0FE,000,000,000,000
310000020,00,0FE,000,000,0FE,000,000,000,000
320000020,00,0FE,000,000,0FE,000,000,000,000
330000020,00,0FE,000,000,0FE,000,000,000,000
340000020,00,0FE,000,000,0FE,000,000,000,000
350000020,00,0FE,000,000,0FE,000,000,000,000
360000020,00,0FE,000,000,0FE,000,000,000,000
370000020,00,0FE,000,000,0FE,000,000,000,000
380000020,00,0FE,000,000,0FE,000,000,000,000
390000020,00,0FE,000,000,0FE,000,000,000,000
400000020,00,0FE,000,000,0FE,000,000,000,000
410000020,00,0FE,000,000,0FE,000,000,000,000
420000020,00,0FE,000,000,0FE,000,000,000,000
430000020,00,0FE,000,000,0FE,000,000,000,000
440000020,00,0FE,000,000,0FE,000,000,000,000
450000020,00,0FE,000,000,0FE,000,000,000,000
460000020,00,0FE,000,000,0FE,000,000,000,000
470000020,00,0FE,000,000,0FE,000,000,000,000
480000020,00,0FE,000,000,0FE,000,000,000,000
490000020,00,0FE,000,000,0FE,000,000,000,000

```

BACK TO BASICS



In part two of Colin Wilton-Davies' series, he shows you how to set up simple programs, like multiplication tables

I hope those of you who started to explore Spectrum BASIC with me last week because you were bored with tapping stone tablets are equally bored with the idea of programming! Admittedly, as you could get so excited by the basic program we coded up with:

```
100 FOR C=1 TO 12
110 PRINT C;" "
120 NEXT C
```

All it does is print, in a column, the products of every one of the integers from one to 12. I'm sure most of you could see that for yourselves, but with a more complicated program it is surprisingly difficult for even I's not to let me remember what it was supposed to do when it is resurrected after a few months.

BASIC fortunately allows us poor humans to write little reminders to ourselves in the shape of REM statements (short for REMARKS). It is a good practice to put into the body of every program a few lines like this as your programs. Anyone who has been in the position of having to get bugs out of someone else's program or of having to adapt a program to particular needs will endorse that. In Spectrum BASIC, when your cursor is flashing 'E', pressing the 'R' key will produce the 'REM' keyword on the screen. Add that line to the program:

```
10 REM Print out the seven times table
```

and when you RUN it, you get exactly the same result as you

did before. The REM statement is for humans, and the computer will ignore anything written after it in a program line. Now let's make the program really do what I'd like it to do, in essence, it doesn't print the proper table, just the products. It would help if we had some words as well as numbers — to do this, we have to use the operation marks, which we get by pressing SP (symbol shift) and P (together forms the last).

```
40 PRINT "Seven Times Table"
```

Now when you run the program, the heading "Seven Times Table" is PRINTed above the column of figures on the screen. Press the ENTER key, and the LISTING of your program replaces the column of figures and the heading, with the 'X' pointer at line 40, the last line you entered.

Now press the down arrow (OK), and the pointer moves down to the next line, which is line 100. Press "EDIT", then "DELETE" three times, and the "100" will disappear from the editing line at the bottom of the screen; replace it with "70", and press ENTER.

Now you have two lines with the same operations, get rid of the second by typing "100", it's number. Now enter the new line:

```
80 PRINT C,
```

and don't forget the semi-colon. The semi-colon tells the Spectrum not to print anything in

new line after PRINTing the value of the variable 'C'. If you RUN the program now, there will be no separation between 'C' and it's product, so we also need the last:

```
90 PRINT " " ; C ; " ";
```

Notice the space just inside each operation mark; that makes things look tidy in the output. Now when you RUN the program, you really will get the seven times table, but it still needs a bit of tidying to make it perfect — notice how the next four columns have gone where 'C' has increased from one to two digits in length.

Let's try the "TAB" function, which is like the Tabulator key on an office typewriter, but more controllable. On the Spectrum, TAB is obtained by first pressing CAPS SHIFT and SYMBOL SHIFT together, then "P" (XP in my shorthand), EDIT line 90 as usual:

```
90 PRINT TAB 5; " " ; C ; " "
```

and you have your output in tidy columns. TAB 5 means "move the printing position right to the third position on the current line", and if the print position was already past that, it would have no effect.

I suggested SAYing your first program to "bever", so as to avoid confusion, SAY it this one as "table". Supporting your younger brother, with the Spectrum's assistance, has now learnt his seven times table by heart. This could now go on to write programs for the six, five

and four times table, but this would be a waste of effort. Instead, let's put the program more under the user's control. Define lines 50 and 60, and enter:

```
10 REM prime multiplication table
20 INPUT number
```

The "INPUT" statement is obtained by pressing the F key when you have a keyboard cursor flashing. "F1" The Spectrum wants a number for you to type in a number, and when you press ENTER, stores the number as a variable called "number". Now EDIT lines 50 and 110 to read:

```
50 PRINT TAB 10; " Times "
number;" = "
110 PRINT number
```

RUN this, the screen goes blank, except for the flashing "F" cursor at the bottom. You must remember that the

Spectrum is waiting for you to type a number and press ENTER. This is not what is called "user-friendly", enter a number for now — say three — and you will get your three times table. Now add these lines:

```
40 PRINT "Type a number and
press ENTER"
50 PRINT number;" Times
Table"
```

See the difference? The program is much more variable than our first version, but easier to use. Because we are encouraged by the computer. The last thing we need to do is get rid of the words "Type a number and press ENTER" before the table is printed. The simplest way to do this would be to insert a "CLS" (Clear Screen) statement at line 55, but a better way is to use the INPUT statement to do the prompting.

Anything in quotation marks

between the INPUT itself and the onset of the variable in the INPUT will be printed at the bottom of the screen until you have pressed ENTER, then it will disappear. You could EDIT line 55, but there is less typing if you EDIT line 40 to:

```
40 INPUT "Type a number and
press ENTER";number
```

and of course, get rid of line 50 by entering 50. Now when you RUN the program, you have a prompt which disappears after use, and a nice neat output. SAVE the program now.

Something may be missing: the most obvious of you I've only used two variables in this example, and I called one of them "number". It makes programs easier to read and understand if variable names are self-explanatory.

"OK", you might say, "Why not call the other one 'times', then?" I would like to, but it is

built in to Spectrum BASIC that "control" variables, as they are called, have to have single-letter names. Play with the program, and you will find that you don't have to enter the INPUT to generate integer numbers, or even to just numbers.

A great strength of Spectrum BASIC is that you can INPUT "expressions", and these will be accepted if they are valid. Try INPUT from "1+3*2" (20) or "5000 > 10000" (false) means "the Square Root of 5" is valid expressions, and "500 < 5" is an invalid expression, neither the helpful "Error message" you get in the last case. You can build up very complex expressions by using brackets and the Spectrum even-checker procedures will make sure you are in any right or left-brackets — 17761.

Next time, we'll experiment with colour and sound in the Spectrum.

Programs are always supplied on cassette and are accompanied by full details of the program variables, how the program works and any hints on corrections you can offer. Please type these details double spaced. Listings are helpful but not essential. What is vital is that the programs should be completely error free, so please double check.

Always use a coupon firmly fixed to the back of your envelope, and fully complete and enclose the cassette entry card.

We are particularly interested in programs with less than 100 actual lines of BASIC. All submissions are acknowledged.

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SOFTWARE



Dark Tower

In this graphical adventure from Midbourne House, you play the part of Frank May. This on-for-ever individual has been tapped by the powers of the dark tower and has entered into a long and dangerous journey to a great power with him. The turn is simple, you must collect all the jewels from the 28 rooms in the tower. Once this is done, you have a final score to solve.

Each room has the usual hidden platforms, ropes etc to enable you to collect the jewels which are protected by a variety of robots and other objects, such as parolling a female one. The problem is to turn on the main sequence of jumps, moves and other devices necessary to collect the jewels. Hence, this game requires great patience and dexterity. If you collect all the jewels in a room, you get a confession. The first 200 people who see these 28 letters to solve the final problem will win a free game.

Graphically, this game is well designed but not exceptional. The background music, however, is superbly written and arranged. The degree of difficulty of the scenes varies markedly. Periods are used with a few breaks which give a juicy, high-resolution picture. Loading was fairly fast. Some are even simple while some are tedious.

While I enjoyed this game, it isn't particularly original and our office is reluctant to come home and stand in this reservation, this game is certainly worth checking out.

S.W.

Price: £6.95

Publisher: Midbourne House

Address: Castle Yard House,
Castle Yard, Richmond, TW9 1J
STP

C64



Empire of Karn

After the success of *Empire of Karn*, it isn't surprising that a sequel has been written. In fact, according to the sales, a third part should appear in due course. The sales contain the usual background facts full of mysticism and unbelievable names. It appears that you are up with a fellow called Dain and set forth on a quest to find the real intentions of Zarf — I think.

Compared to the previous adventure, this game shows a number of technical improvements in keeping with the state of the art. The program loads quickly using Interspector's own turbo loader with no glitch. The first real advance is the improved speed of drawing the various scenes. Midbourne House is used to produce quite acceptable results. Basic concepts are well in good time and graphics simultaneously. The tropical landscapes of each location are fast but hardly earth shattering.

Another advance is the use of instructions with other characters to provide greater interest. The command parser is fairly competent and will allow you to converse with other characters. One surprising omission, however, is the absence of commands such as "Examine". This proved to be rather irritating. No "Help" is offered either, which will deter the complete beginner.

Overall I must say was impressed with the atmosphere generated by this game. In spite of the problems, I couldn't get deeply involved in the game. The problem was enhanced by the unhelpful responses to minor comments. At the price, quite good value.

A.W.

Price: £7

Publisher: Interspector Micros

Address: London House, The
Green, Tadley, Hants

C64



Screaming Abdo

Now here's a rare thing — a game for the Dragon that can compare with the more popular ones. There has been quite a long rest period in software houses are up the market potential for a device that is not off from its supplier. Perhaps some people will notice that a software starved our group is worth waiting for — where the second shall show.

The game itself might be considered a little unusual as you jump onto moving platforms, take care of walking floors and avoid all the many elements. When I thought was particularly good was the imagery of the scenes design, there are 15 different scenes, and the sense of humour developed in creating revolving scenes, trapping monsters and other assorted objects to set you down to size.

It's a black and white using the highest resolution and therefore quite detailed. The animation of the little man is particularly good as he bounces his way through.

The title page offers a chance for up to four players and an opportunity to randomise the order of events. This is a memorable feature as I usually get stuck on the first screen and consequently get bored trying to see more of what's on offer. Not only do you get a chance to play some of the other scenes but a demonstration option goes through all the scenes in the background should you choose to do so.

Scoring was a bit sparse but the colour was not missed at all. Great value for money and an additively playable game.

M.P.

Price: £6.90

Publisher: A & F Software

Address: Unit 8, Canal Side
Industrial Estate, Wokingham
Bk, Wokingham, Wokingham
RG40 1LB

DRAGON





Penetrator

You don't get any points for getting shot, this is a scramble tank chase. In fact, this game appeared many months ago in the Spectrum and has now been converted to the 64.

The scenario is quite standard and involves picking a route zig-zaggingly down a network of roads. The faces of the tanks are litened with radar pointers and guided missiles. There can be limited or shot for points. Unlike previous, you don't have to break to pass. Additionally, it appears that the longer the Radar pointers are operating, the more accurate the missiles become. There are four stages to the tanks and you must destroy a certain bomb carrier in the last phase to complete the mission. To help you gain expertise at negotiating the tanks, there is a training mode which enables you to try any of the four stages with unlimited lives.

The graphics are really decent, with jolly mushroom cloud explosions and nicely animated radar screens. A potentially useful option is an editor for customising the landscape. This is, if I could get it to work, properly. It can only assume that there was a bug in my copy since the editor wouldn't work as described in the instructions.

Overall I found this game a little easy and rather boring. In spite of the additional features this game is not as impressive as the classic scramble game and Mailhouse House is probably about 18 months too late in releasing the game.

A.W.



Stellar 7

For many months I have awaited the appearance of a version of this year's arcade game 'Starlink'. Here it is, at last. The scenario is simple. You control a tank-like vehicle and must program it a way-link to various star systems, destroying the various enemies on the way.

The display gives you the view through the front of your tank. The scenery and opponents are drawn as line shapes. The strength of the game is the 3D effect which is generated as you move. The positions and other objects change position, shape and size relative to your movement. These changes occur rapidly without any trace of flicker. As the scenery flies at you, even the laser bolts or shells are visible as they land at your direction. Scattered around the area are obstacles and fuel dumps. The latter are useful to replenish your reserves.

When you reassemble the way-link, you can use it to move on to the next phase. You are equipped with shields whose strength is depleted as you are hit and you have an invisible cloak for moments of extreme danger — at great cost to energy.

Everything about this game is professional and slick. The animation is superb with nice transitions between screens. The comprehensive instructions are supplemented by a superb introductory sequence in the program describing the various adventures. Both keyboard and joystick control are supported.

As the price this program is excellent value and totally recommended.

A.W.



Bigger Goes To Hollywood

This is another in the Bigger series by Higgins and is just as impressive as its predecessor! The object is to appear in a film. In order to achieve this you must first reach the producer's (a character named Spectacular) office.

Attempting to stop you in this are a number of well known film characters such as James Bond, Superman, Batman and the Hulk. There may be broken out by picking up broken props and throwing them at the aggressive characters. There is no indication which prop will take on which character although they are numbered in some way — for instance Batman is taken out by a 'P-O-W'. Another way to identify which prop to use is that as you enter a character's screen the game music changes to a theme from a film — identify the theme and you have the character. Once the characters have all been taken you are shown into Spectacular's office where you have to do it all over again!

The graphics of the game are very like Starlink, with a 3D, four way smooth scrolling display. The sound, as I mentioned consists of quite a few notes and is thus very good, especially the love theme.

The game is very difficult at first as each time the characters touch you you lose a life and you only have five lives. Control is by joystick and I don't like this much so Bigger tended to get stuck trying to go through doors and a always happens as the most critical moment!

The game also features walls that glow and shrink to hinder you, telephone boxes which appear if you spend too long anywhere and also the 'Birds' which appears to flash you off!

An excellent game and one for every C64 owner! E.G.D.

Price £9.95

Publishers: Higgins

Address: 1 Orange St, Sheffield



★★★★★

Flipped



★★★★★

Hacked



★★★★★

Keen



★★★★★

Yawning



★★★★★

Cambridge

Price £8.95

Publisher: Mailhouse House

Address: Castle Yard Bldg, Castle Yard, Richmond TW9 6TP

C64



Price £9.95

Publisher: US Gold

Address: Unit 10, The Parkway Industrial Centre, Hennessy St, Birmingham B1 4LS

C64



C64





Sold on Sunlighting Bay

There is a sophisticated game for thoughtful, sit-at-a-computer editor. You are a literary editor whose mission is to stop the building of a new machine. The machine is being built in an factories located on well defended islands. The game is so much more a hundred screens of hi-resolution graphics.

You operate from an aircraft carrier and to help you navigate this vast area there is a radar screen showing the surrounding sea screen. There is also an indicator pointing to the direction of the carrier. You have unlimited missiles but only three bombs per flight. The joystick gives you very realistic control of the shipper, so when a lot of pressure you are up and away.

Although your main concern is locating and bombing the factories you need to attack and destroy the fortifying weaponry. You need to also destroy any radar apprehensions you come across. These help fighter planes locate you. Add another thing, bombers attack your carrier so you need to nip back towards the warning alert screen.

If by some fluke you manage to eliminate all six factories you are treated to a newspaper account of the results and a victory parade on the screen, needless to say I never reached that stage.

This is a good game that allows you to try out different tactics to just up your game as you can day readily for the victory parade. The graphics and sound are excellent. Only a price reduction can make a better value for money.

L.C.

Price £12.95, disc

Publisher: Avalonsoft

Address: 73, Watfield Ave., London NW10 8AU



A Day in The Life

A day in the life of Uncle Dave is the story line for Macroman never actually progresses the game is of the Homer type with large, coloured shapes moving freely about the screen. Dave has been made Game Commander of the British Empire and today's the day when he receives the honour from the palace.

You start in Dave's house and your guide has to get him out and then a key to let him out. All this must be achieved while avoiding cars, bus and flying television sets. Once outside the game continues in the same vein for the next 20 screens, taking Dave to the railway station, the job, a water bar and finally the Palace itself. All the while Dave must pick up certain objects on each screen in order that he may move onto the next one. The graphics, as I mentioned, are large and move very smoothly. Control is by keyboard or joystick and the keys can be modified if necessary.

Sound consists of an annoying little tune that constantly can be switched off. The instructions are very clear and funny with repeated references to making a crash down in the Ocean Islands (once play).

Finally the game leads under a special loading system that has blocks, if a block fails to land then the tape has to be rewound to the beginning of the block and another attempt made, rather than having to do the whole tape again.

J.G.B.

Price £6.95

Publisher: Macroman

Address: 230, Lonsdale Rd., London SW4



Note Commander

In this war game, you play the part of a Note commander tasked with regaining the invading Warsaw Pact Forces — Russian, East German, Czech, Polish and Hungarian. To perform this task you have access to British, American, West German, Dutch and Belgian forces. All forces are divided into the usual groups such as armour, mechanised infantry, airborne, nuclear units etc.

The actual play is fairly straightforward. You are given a map of Europe showing the development of forces. The map, being larger than the monitor screen, scrolls when necessary. Using a square cursor, you instruct units to move and attack the enemy. The game is played in accelerated real time with the rate and time displayed on the screen. Periodic bits of information appear on the screen and can be used to determine post strategy.

Four commands are available involving different attack threats and patterns. The final result of the game is a combination of loss of material, positional considerations and political points. Political points vary depending on how the campaign was conducted, whether conventional, chemical or nuclear weapons were used.

The use of graphics and sound are effective and the game played smoothly with no significant loss, although there were some aspects which didn't perform as described in the instructions. On the whole this is a tough game which tries effort to move and will probably appeal to the enthusiast. At the price the game is a little expensive but is still reasonable value for money.

J.W.

Price £9.95

Publisher: US Gold

Address: 30 The Parkway, Ind. Est., Hinxton St., Cambridgeshire CB3 0LT



Gogo the Ghost

Gogo the Ghost is a low tick. Some evil ghost has imprisoned his beloved persons in the castle. Your task is simple: guide Gogo to the persons as they can't live happily ever after. The cassette entry informs you that she is locked in room 150, so it would take a good look as you could be in the castle for quite a while.

Each room Gogo enters has a mirror, and some also have names. As the time you are asked for a password, and entering a room named enables you to communicate from that point.

Upon entering a new room Gogo appears sufficient power to allow him to become invisible for a few seconds. This enables him to pass through any of the passages which guard each room. Gogo is made invisible by pressing the joystick, this button. However, pressing the button a fraction too soon causes Gogo to reappear in mid passage and "DIE!" as says Gogo. According to Fordham, "DIE!" is Swedish for "EAT!" — who says games aren't educational.

Apart from the passages you will also find a variety of useful objects scattered around the rooms. Their purpose isn't known until Gogo picks them up. At this point one of its symbols at the base of the screen will be illuminated. The symbols represent life, power, fast, and differing numbers of bonus points.

The graphics are highly spectacular but this didn't detract from the playability of the game. At a cost of £3.95 the game represents excellent value for money.

J.B.

Price £3.95

Publisher: Parked

Address: Williams House, Upper St. Martins Lane, London WC2N 6BA





Bridge Player 2

A bridge player I am not — but, with many more hours than this program and I shall be seeking its company — as perhaps CP Software already publishes a Basic Course in Bridge? This is a well designed and well-engineered program, with many features available to the experienced player, making it a sharp tool in his own hands.

You are offered a series of five options for statement, "open, pass, double, you draw", "play the cards from all four hands" or "in the computer play the defender's part". Then, after a short shuffle, the computer deals the cards, either showing four hands or two, on a green cloth, or just your hand, leave it scoring top while you make your bid.

Score shows number of hand, dealer, and contract at top left with score bottom left, but each player bottom right — winner flanking — the variable shows cards as dealt and N, E, S and W hands around that. Quite realistic and easy to follow.

Building is in accordance with the Abridged system — though its expert level uses it makes variations both when the computer takes partners.

The program offers post-mortem facility with relabelling and/or relaying of any hand, full scores, both of the game and separately, the ability to suggest selected hands, replay bids, see the play to the rubber trials, pop at the appearance's hands and at any time to go on to the next hand or to return to the option list.

Must stop now — it's my turn.

T.W.

Price £9.95

Publisher CP Software

Address: 2 Clabe Road, Uxbridge, Middlesex



Sleuth

Sleuth is an extremely clever and useful BASIC debugging tool which has dual screen and single stepping modes. However, its wide range of commands and facilities mean it is not easy to "dive" but once the operating sequence has been learnt one begins to appreciate its value for developing new, or debugging old, programs. The complexity means that a short review cannot do justice to its full potential, however, here goes.

Sleuth is similar to a machine code monitor program and can be entered before or after loading a program. Fewer problems will be experienced if the ROM is entered first. Then a program can be loaded, stored or listed.

The control screen has a very clear display which shows status, current line being executed, current procedure, value of variables in current statements, values of user selected variables and a space at the bottom of the screen, set aside for command entries. Each statement in the current line is highlighted so it is easy to see and the variables are continuously updated as the program runs.

The speed of program execution under Sleuth's control can be varied from one to 100 statements per second and may be frozen at any point, which when combined with dual screen mode enables the user to analyse the effect of each statement on the screen display.

Conditional and unconditional breakpoints can be set so that the program will stop running on reaching a predefined line number. Similarly,

variable breakpoints can be set so that the program will halt when a given value is reached. Conditional breakpoints can also contain a BASIC keyword. For example `AND = (IF)score >= 1000` is acceptable, but `AND = (IF)N(X)` is not. All breakpoints may be temporarily disabled and can be displayed on the control screen.

Whilst the program is running Sleuth allows the user to halt the execution of the program and change the value of any variable so as to see an effect upon the screen display.

It will allow a program to be run from any line number or can be made to jump a section by a GOTO statement. In addition, a multi-step command can be used to avoid the problems of single stepping through long time delays.

The control screen also shows the ending levels of FOR loops, GOSUBs, REPEATs and PROCs, which can be useful for checking that loops are properly sized.

The package includes a comprehensive instruction manual and a page to read this very carefully before using Sleuth. It wasted no hour trying, consequently, to give dual screen mode before finding out that one has to enter this mode before loading a program. J.B.

Price £29

Publisher: Softscape

Address: PO Box 50, St Albans, Herts



Premier League

This is a football management simulation written in just under six of BASIC. In it, you are the manager of a Division 1 team, and have to work your way up to the top, or last, relegation. You can equally be tasked for financial management.

At the beginning of the season, you can give your team a name, then, arrange the squad. For each number, all will know named footballers, you are given position of play, skill rating and current form. At the same time, you may see the squads of all the other teams in the league. The same information is given, but the players are numbered and named. This becomes important when you come to top or off a player later, on transferring beginning players.

From your first signal of 19, you choose who is to play, and who will sub. You may also choose to have training sessions. These may be very successful, in which case your players' skill improves, or they result in injury. What all this is done, it's off to the match!

The league plans to show a football field from above, and at various points in the match opportunity is given to play your sub. Names of scoring players are given. The final result is incorporated in the league table.

If that all sounds like Addictive's Football Manager, it is! The difference is the it's slower, cheaper, and doesn't feature the match highlights. Not as good as my opinion.

D.M.

price £4.95

publisher: E & J Software

address: 34, Seaford Rd, Farnham, Middlesex

SPECTRUM

BBC

SPECTRUM

173



Quasmodus

I have my doubts about the use of an individual with such a spinal deformity as the central character in such a game, despite the slender association with the famous resident of Nighty Nights.

This game claims to be arcade style, which in essence means that it has the look of the arcade game but not the speed, and that can often be a telling factor in popularity. For all that, a skill manager to provide a challenge to the younger set.

The opening screen allows a choice of either controls or keyboard control, and the facility to practice any of the 20 screens until you feel confident enough to go ahead. In essence this is, I suppose, a King derivative, while Quasmodus must attack a hell and may it, coping with magic guards, arrows, fireballs, and levitate. Yes, levitate. The ultimate goal is the rescue of Quasmodus, who just happens to look like a little bit like the implementation. If he manages to roll the ball in each of the 20 screens, a special feature comes into play — I never found out what that might be.

If Quas is still speaking around, while the displayed screen has continued down to zero for the last one of his last few seconds. The process of running is therefore vitally a necessity.

The graphics are quite good, but the keyboard response leaves a lot to be desired. (Recommendation is fairly good, and the speed package is used where a graphic quality which is clearly superior on the 4A.

This needs Extended BASIC and has a control option. P.R. Price £1.95. Publisher: Intergraph Software, Addressee: Chiswick Rd, Twickenham, Kent TW9 6UU.



Tempest

One of the most machine aspects of a space pilot's life is a target drive.

There's not in your ship, the Chex, usually moving around the rim of the targets keeping a wary eye for oncoming violence. Occasionally however, things get a little more hectic when a squadron of alien craft, a little starship, capturing Tempest from Spectrum is based around part of their resources.

The starship is a near frame construction that moves in perspective down into the screen. The great shape of the machine varies from level to level. Perhaps, presumably, on the rim of the gate you are attacked by ever increasing numbers of aliened ships. These make their way slowly up the gate, increasing in size as they approach. Using your left and right rotate controls you flip around the rim of the gate, using your laser down on or to the enemy. A more effective way of vaporizing the alien is to use your space sapper, but you are only allowed one such sapper per screen.

There are a multitude of different enemies, some split into two when hit, some have a very green split in their wake. These again must be avoided at all costs when your time is counted down the starship at the end of each successfully cleared screen.

Moving played Tempest in the arcade in several instances, I was slightly disappointed to find that the Basic version was written using Mode 3, but once I got accustomed to the low resolution screen the game was just as exhilarating as the original. P.R.

price £9.95

publisher: Spectrum Software

address: Ground Floor, Regent Hse, Skinner Lane, Leeds 2



Tiler

Investigator has a reputation for making games. Could the brilliance transfer to the Spectrum, I wondered? In Tiler, you are an Agent contracted to investigate who stole the roof of King Richard's house. This involves crossing that screen to collect a key, then a file, then a letter, while avoiding not himself, who becomes around in deadly fashion.

Unfortunately, the investigator might have not worked on the Spectrum. The game looks professional. Although the background graphics are well drawn and colorful, both the animated characters are jerky and unconvincing. Based on average, as are the instructions. The high score table is frustrating to use.

If the description at the top sounded like a plot from game, I needed more. Very little detail is needed, and with only one possible way of dying, there is nothing to avoid. Movement between the small number of floors is by one way lifts, attempting to move the wrong way causes your time to stand paralyzed. He probably makes how boring the game is.

The small number of screens only adds to the game's basic flaw: it is extremely tedious. That's not much of a lot of tiles, but the task does not change at all — every time you have to follow the same, long-winded routine. Quite how interlocking makes people to like this, I have no idea.

There are many, much better games for your Spectrum, some at half the price. Let's not make a comparison of Commodore games, except Interceptor P.A. Price £1.95.

Publisher: Interceptor, Addressee: London, Hove, The Green, Tolly, Hove, England



Mini Office

Four programs for less than the price of one!

To prove the point that potent yet programs, this classic business package has succeeded in integrating several chart-topping games programs down a page or two.

View the better evidence has the ability to handle his or her own personal database and spreadsheet — project the data to a sophisticated graphics package and communicate using a rudimentary word-processor.

Obviously the database will be well thanked. Its capacity to keep records of various images and comparisons with your current needs is phenomenal, if only as the oft suggested personal telephone directory, or perhaps more usefully a magazine review index.

Good for keeping tabs on financial transactions, the spreadsheet reveals all. Time spent (coloring it in for your own needs) is well rewarded. Almost any analysis of income or expenditure, for a personal, private or business can be output to the screen or printer.

The manual is so small and prove enlightening. Comparison of the money spent on computer expenses and brand for instance, replacing the convenience of post-mortem.

The graphics package is paired with data generated by the spreadsheet. Here a personal representation of the figures is produced as a 3D bar chart, a pie chart or a simple line graph.

Lacking the business of right justification was a disappointment. On the other side was a word processor displayed at the top of the screen, along with the number of words per minute being typed in edit mode.

Miniature your desktop with the rest of the. B.B.

Price £1.95. Publisher: Graphix, Addressee: 68, Chiswick Rd, Hazel Grove, Stockport

TI99

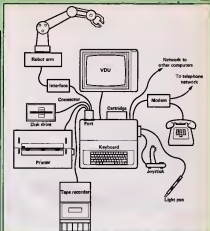
BBC

SPECTRUM

AMSTRAD

In this pull out and keep jargon guide Iain Murray guides you through the maze of computer terms and jargon

TEACH YOURSELF JARGON



This list covers most of the common buzzwords, and is not alphabetic, but thematic, beginning with the internal workings of the computer, through software terms to computer systems and applications.

Microprocessor: This is the brain of a microcomputer, a single integrated circuit chip which contains all the circuitry necessary to perform the logical arithmetic and 'housekeeping' functions necessary in a computer. A microprocessor can only move numbers around in its memory, add two numbers, and compare two numbers. However, when such microprocessors are grouped together to form a program, the simple instructions combine to give the microprocessor an apparent degree of 'intelligence'.

Generally, a microprocessor can perform these functions very quickly, often more than a

million in one second. The speed of the microprocessor is governed by a clock circuit which provides a 'heartbeat' for timing the operations within the computer.

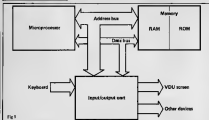
The microprocessor communicates to other devices within the computer along a bus which is a collection of wires along which data can pass. Usually two buses are used, an address bus which carries the memory location which the microprocessor is looking at, and a data bus which carries the information being read into or out of the microprocessor.

Random access memory (RAM): The store given to memory which can be written to by the computer, where programs and data are stored. RAM can be randomly accessed, i.e. data can be input and output to anywhere in the memory at any time, and it does not need to be read as a continuous stream of data. RAM

is volatile which means that the contents of the memory are lost when the power is switched off.

Read only memory (ROM): A type of memory which is also randomly accessible, but unlike RAM it cannot be modified by the computer, only read from. The contents of this memory device are placed there when the integrated circuit is manufactured, and generally contain data necessary to the working of the computer.

In home computers, ROMs usually hold the BASIC language, character sets and operating systems. Some types of ROM can be programmed and reprogrammed by the user, but special equipment is required to perform this. Moving of ROMs: Chips available include programmable ROMs (PROMs), Erasable Programmable ROMs (EPROMs) and Electrically Alterable ROMs (EAROMs), but RAM and normal ROMs



functions and algorithms (program sections defining a particular operation). This avoids too many program jumps which can lead to a very confusing program when you look at it later.

Variables: High-level languages allow you to assign names to the numbers (variables) you are using in your program, which makes manipulation of the numbers much easier.

Variables are usually one of four types: real variables contain numbers with decimal parts, i.e. not necessarily whole numbers. Integer variables contain whole numbers, i.e. numbers with no digits after the decimal point. String variables are used to hold lists of real characters or words, and to manipulate these words.

Arrays are special variables, consisting of a table of variables (real, integer or string) all with the same name, but each subscripted with a different number. When used in program loops (program sections repeated over and over), array variables become very useful. They may be constructed with more than one dimension (i.e. more than one identification number).

Bug: This is a computer expression used to describe a fault in a program, or a lot of software which does not perform as expected. If a fault is particularly bad, it may cause the computer to crash which means that it either locks up and you cannot regain control of it, or it automatically reverts itself and your program is lost.

are usually all that are used in microcomputers.

Input/output (I/O): All microcomputer systems require some form of I/O in order to receive data from the outside world, and to output results to the programmer. This is performed by the I/O unit which may be connected to a keyboard, VDU screen or other peripheral devices (Fig. 1).

Memory map: Figure 2 is a diagram of the memory area available in a microprocessor-based system and shows where the microprocessor must look for its data.

Bit: A binary digit, i.e. a single '1' or '0' state in memory.

Byte: Eight bits, each byte differently weighted so that a byte can hold a value of up to 255 (decimal). The Least Significant Bit (LSB) has a weighting of one, the next bit a weighting of two, then four, eight, etc up to the Most Significant Bit (MSB) which has a weighting of 128 (Fig. 3).

In eight-bit microcomputers, memory is arranged in bytes, with 16, 48, 64 etc. kilobytes (K) of memory available, 1K being equal to 1024 bytes.

Memory bytes can hold data, instructions, algorithms, etc., and may be joined together to form words of 16, 32 etc. bits, or may be split up into their individual component bits or nibbles (four bits).

Machine code: The native language of the microprocessor, comprising a series of numbers stored in memory which form a chain of instructions and operands for the microprocessor.

to perform. Machine code is a low-level language because it is difficult for humans to understand, but easy for the microprocessor to execute very quickly.

Assembler: A program used to make the writing of machine code easier. All machine code instructions have a mnemonic (a short code word representing the function of the machine code instruction). An assembler program allows the programmer to write his machine code in these mnemonics.

It then goes on to convert the mnemonics into the machine code numbers which the microprocessor will execute. A disassembler program performs the opposite task, converting a machine code program into a list of mnemonics.

High-level language: An English-like language which makes programming easier for humans. It contains words and structures which make the program's function more easily understood. However, before the program can be executed, it must be turned into machine code for the microprocessor to execute, and this is a slow process.

This can be done as the program is being executed (at run time), using an interpreter program (this is the usual method on home computers), or can be done beforehand using a compiler program.

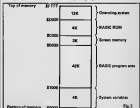
Compilers create a new version of the program in machine code, which can be executed directly at run time, the speed of the new version being dependent upon the efficiency of the compiler. It is usually faster than the com-

compiled version of the program.

With an interpreter, the program code is changed into machine code as it goes along, and it is the process which causes high-level languages to run so slowly.

Examples of high-level languages include BASIC (Beginners), All-purpose Symbolic Instruction Code, FORTRAN (Formula Translators), COBOL (Common Business Oriented Language), ALGOL, ALGOL-like languages and PASCAL. These languages contain different programming structures and facilities, and their use varies according to the type of program being written.

Structured programming: Effectively a 'clean' form of a high-level language program, with the program broken down into easily understandable 'modules' of code containing the program's conditions.



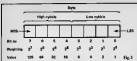


Fig. 1

Errors in the machine or the program which cause the computer to crash irretrievably, or to lose its memory are said to be fatal. If an error occurs only very occasionally, it may be due to a little unit running being faulty, or due to some outside influence on the computer, such as electric rain and mains voltage spikes. These random faults are said to be soft errors.

Digital: Indicates data storage/transmission by way of a series of 'yes' or 'no' states in a circuit.

Analog: Indicates data storage/transmission by the use of a varied voltage in a circuit.

Binary: A number system comprising only the numbers 0 and 1 (high and low states). Binary numbers are to a BASE of 2 (decimal numbers are to the base 10). Binary arithmetic is used by digital computers because a BIT can only hold the numbers 0 and 1.

Binary: A number system comprising only the numbers 0 and 1 (high and low states). Binary numbers are to a BASE of 2 (decimal numbers are to the base 10). Binary arithmetic is used by digital computers because a BIT can only hold the numbers 0 and 1.

Decimal: A number system comprising only the numbers 0 to 9, i.e. to the base 10. This system is sometimes used by convenience by machine code programmers.

Hexadecimal: A number system comprising the numbers 0 to 15, i.e. to the base 16. Numbers 10 to 15 are represented by the letters A to F respectively. This system is often used by machine code programmers for convenience. Hex numbers are denoted by a preceding H sign or a lower H after the number.

Parallel: A method of data transmission. Several bits of a digital signal are being passed simultaneously along a number of individual wires. It requires more wires, but is faster than

the serial method of transmission in which data is transmitted one bit at a time along a single wire. Serial data requires a more complicated transmitter and receiver, but parallel data is more subject to interference if transmitted over a long distance.

PCB: A Printed Circuit Board is the flat board on to which the electronic components of your computer are attached, and which contains the circuitry necessary to link the components together.

User: The person or persons who apply to a computer.

Printer: A device for producing a hard copy, a printed copy of program listings or other documents produced by a computer. Printers might be pre-type (connected to with a ball-point pen head), dot-matrix (which form letters from a series of dots), or daisy-wheel type (like has a head containing characters pre-formed, ready to punch on to the paper).

Plotter: This is a special type of printer, operating on a flat sheet of paper, used to produce large graphic displays with a moving pen.

Floppy disc: A magnetic disc like a gramophone record which can be written on to in read form by a computer using a disc drive, enabling programs and data to be stored permanently for retrieval later.

Data is stored in random access format, enabling it to be retrieved quickly. Hard discs are not usually interchangeable, although they can store much more data than a floppy disc.

Magnetic tape: Tape on to which data and programs can be stored in a serial fashion, making data retrieval slower and more difficult than with a disc system. For home use these are usually tape cassettes.

File: A block of data stored on disc or tape. This can be numbers or strings placed to be read by a computer, or a

program file. They are accessed by using a filename.

Cartridge: A device used to hold a program in some form of solid state. The program can then be accessed by plugging the appropriate cartridge into the computer, and it is then immediately ready for use.

Hardware: Any physical part of computer apparatus including keyboards, connectors, printers, disc drives, etc.

Software: All programs running within a computer's memory. Also often applied to tapes, discs, etc. which are used to store the programs on.

Firmware: A combination of hardware and software which applies to memory devices such as ROMs, EPROMs and cartridges (i.e. hardware) but which contain programs (i.e. software).

Video: Anything connected to the visual display generated by the computer.

Sound generator: A device fitted to some microcomputers which is used to create sound effects and music in programs.

Character: The name given to

letters, numbers etc. which are used by the computer in displays and printers. Most computers use a standard set called the ASCII (American Standard Code for Information Interchange) set. Each character is referred to by a number and the computer changes this number into the appropriate pattern on the screen.

Graphics: This is applied to computer displays which are not made up from standard letters.

Low resolution graphics: means that only a small number of picture elements (pixels) can appear on the screen (e.g. 25 x 40). Pixels can be characters — letters, numbers or other defined blocks.

High resolution graphics: is the term applied to displays in which the individual pixels (dots) on the screen can be used independently. Displays of around 300 x 400 pixels are common, although specialised graphics terminals with resolutions up to 1500 x 2000 pixels exist.

Utilities: Programs designed to make life easier for the computer user. They include

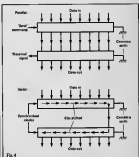


Fig. 4

programmer's aids such as graphics packages and machine code tools.

Mainframe computer: The term applied to large multi-user computers with large memories and vast computing power. These are very expensive and are generally only used in factories and other establishments where a lot of computing power is needed by a large number (10-100) of people simultaneously.

Minicomputer: A large and fast computer, supporting perhaps five users simultaneously. They are used where a lot of computing power is needed by one system, such as real-time simulation of a complex electronic system.

Microcomputer: A small desktop computer for one user, with limited computing power and memory.

Keyboard: The panel of labelled buttons connected to a computer which allows the user to communicate with it. Keys are the most common type of input device.

Joystick: A stick, similar to that used in some aircraft, used to give a simple form of directional controls to a computer. Digital joysticks give a signal of 'on' or 'off' for each direction, whilst analogue joysticks give an output which is proportional to the position of the joystick. Trackballs consist of a sphere, part of which is moveable in two dimensions, with movement controlled by the speed of rotation of the ball, rather than its current position.

Light Pen: A pen held in contact with the output screen of a computer, by synchronising the data from the pen with the electron beam scanning the screen, the position of the pen on the screen is calculable by the computer.

Graphics tablet: A pen, held in contact with a flat board, with a series of contacts beneath the surface of the board, used to sense the position of the pen on the surface.

Digitizer: An unit connected to the computer, with the means of sensing data of their weight. The computer can calculate the

position of the end of the pen. Graphics tablets and digitizers are used to input a picture into a computer quickly and simply.

VDU: A Visual Display Unit is the screen on which a computer gives a video output. This can be a monitor, which is fed directly from the computer or, by putting the video signal through a UHF modulator, it can be connected to an ordinary TV set.

Terminal: The name given to a single unit comprising a keyboard and a VDU, particularly when connected to a mainframe or minicomputer.

Peripherals: A device which is not actually part of the computer itself, such as printer, disc drives, tape drives and VDUs.

Backing store: A non-volatile device used to store programs and data for later retrieval. Examples include disc drives and tape recorders.

Port: The plug or slot on the outside of a computer which is used to connect it to peripherals and other external hardware for input and output of information.

Cable: The plug/socket/cable combination used to connect two points on two pieces of equipment.

Interface: If two pieces of hardware are to be connected, but the data output from one is not in a form which the other will accept directly, then an interface must be used.

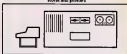
Digital to analogue converter: A type of interface used to convert coded digital signals into a linear analogue output.

Analogue to digital converter: performs the opposite function, used in converting real-world values (e.g. temperature, distance, etc.) into a digital form for processing by a computer.

Network: A special interface used to connect a number of computers together, and to a number of common peripherals such as a disc drive and a printer which can then be used by all the computers on the network.

Modem: Used to connect

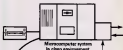
Mainframe computer with compressed memory, backing store and printers



Air-conditioned environment



Up to 100 users simultaneously



Microcomputer system in clean environment

Control interface to external systems

Up to 6 users simultaneously, or self-running simulation system

Home or business environment



Small microcomputer system with its own peripheral units



Single user

computers to each other by way of the telephone system. They transmit the necessary binary

to code and decode the computer data for transmission on the telephone network.

This week
David Ellis
explains some
of the words used
for graphics on
the Amstrad
CPC464

HOW TO DRAW

```

10 MODE 4:DEFINT A-Z:DEFDIM X(50),Y(50):FOR I=0 TO 50
20 WHILE 1:GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
30 L=LEN(LINE$):C=0:DO WHILE C<L:GOTO 40:GOTO 30:GOTO 20
40 C=C+1:GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
50 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
60 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
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470 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
480 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
490 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0
500 GOTO 40:GOTO 30:GOTO 20:GOTO 10:GOTO 0

```



To simplify the operation of drawing lines on the Amstrad screen, the new words **RIGHT**, **LEFT**, **UP**, and **DOWN** will be added to the BIOS. The following ramblings concern these words.

2 GRA SET PEN (AMSTRAD)
This routine sets the PEN colour of the line to be drawn. The PEN value is passed, via the accumulator, to the routine. The value in the accumulator is "masked" so that it's range is correct for the current mode. I.e.

```

MODE 0 value 0 to 3
MODE 1 value 0 to 3
MODE 2 value 0 to 3

```

2 GRA LINE RELATIVE (AMSTRAD)
This will draw a line relative to the current graphics cursor. The cursor position is updated accordingly. If the point specified lies outside the graphics window then it will be ignored. The entry to the subroutine that DE register must contain the horizontal (X) offset, and the HL register the vertical (Y) offset.

All that is required is to set the colour for plotting, and set the required X and Y offsets. The four movement code numbers are shown in listings 1 and 2. The following points may be of interest:

The subroutine to set the plotting colour (if specified) is located from **00300** to **0030F**. The colour will only be set if two parameters are passed with the word. All four words branch to that subroutine from the information from **00374** to **00382** (a constant can be used by both **DOWN** and **LEFT**

Occasionally, when the **PARAMETER** routine is called, the other value will be in the wrong register. With the word **RIGHT**, the offset is in HL, when it needs to be in DE. There are no operands on the Z80 to transfer values from register pairs. It would be nice if you could say

LD DE,HL ; Load DE register with the contents of HL register

Unfortunately this is not possible directly, so two methods can be used. For the word **RIGHT** I have used:

LD D,H ; transfer the contents of HL to DE

However, for the word **UP**, I have used the other method:

PUSH DE ; transfer contents of DE to HL

Now, both these methods work adequately. The latter method is probably more expensive, but the former method is the most efficient — why?

LD D,H takes 4 x seconds @

LD E,L takes 4 x seconds @

LD D,H takes 4 x seconds @

LD E,L takes 4 x seconds @

Total = 16 x seconds @ 1MHz

PUSH DE takes 10 x seconds @

LD D,H takes 10 x seconds @

LD E,L takes 10 x seconds @

Total = 20 x seconds @ 1MHz

As you can see, a straight exchange of two single registers takes only one third of the **PUSH/POP** method. The

quickest method is always to be preferred!

You may think that an **ASHL** or **ASRH** would have used **LD D,H** and **LD E,L** but you would be wrong. The DE register is flushed at **ASHL** and then a branch is taken to **ASHL** — **POP BC** if you had replaced this with **LD C,C** then the stack would be different on return to **ASHL**. In fact, as the stack is different it is unlikely that you would return to **ASHL** at all!

As for the words themselves, they all have the same syntax:

WORD ; number of pixels (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 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817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1



HEPT.100
(DOWN.100)

If held in DATA statements they would take the form:

DATA 1000,1000,1000,1000

This would draw a 100 square. Listing 3 is a BASIC

program which uses this method to draw an 'atom'. Type the program out if you want to see what it is. Remember to add the four new words to the BASIC first thought!

Next week we will add a word to draw jagged and rectangles, and also a word to fill these 'boxes' in with colour

Listing 3. Machines code listing for atom and left

Down	
Address	Comments
0010	CALL 0010H CD 76 03
0011	LD 0010H 1 00
0012	CALL 0010H CD 76 03
0013	RET C9
Left	
0014	CALL 0010H CD 76 03
0015	LD 0010H 1 00
0016	LD 0010H 1 00
0017	LD 0010H 1 00
0018	LD 0010H 1 00
0019	LD 0010H 1 00
0020	LD 0010H 1 00
0021	LD 0010H 1 00
0022	LD 0010H 1 00
0023	LD 0010H 1 00
0024	LD 0010H 1 00
0025	LD 0010H 1 00
0026	LD 0010H 1 00
0027	LD 0010H 1 00
0028	LD 0010H 1 00
0029	LD 0010H 1 00
0030	LD 0010H 1 00
0031	LD 0010H 1 00
0032	LD 0010H 1 00
0033	LD 0010H 1 00
0034	LD 0010H 1 00
0035	LD 0010H 1 00
0036	LD 0010H 1 00
0037	LD 0010H 1 00
0038	LD 0010H 1 00
0039	LD 0010H 1 00
0040	LD 0010H 1 00
0041	LD 0010H 1 00
0042	LD 0010H 1 00
0043	LD 0010H 1 00
0044	LD 0010H 1 00
0045	LD 0010H 1 00
0046	LD 0010H 1 00
0047	LD 0010H 1 00
0048	LD 0010H 1 00
0049	LD 0010H 1 00
0050	LD 0010H 1 00
0051	LD 0010H 1 00
0052	LD 0010H 1 00
0053	LD 0010H 1 00
0054	LD 0010H 1 00
0055	LD 0010H 1 00
0056	LD 0010H 1 00
0057	LD 0010H 1 00
0058	LD 0010H 1 00
0059	LD 0010H 1 00
0060	LD 0010H 1 00
0061	LD 0010H 1 00
0062	LD 0010H 1 00
0063	LD 0010H 1 00
0064	LD 0010H 1 00
0065	LD 0010H 1 00
0066	LD 0010H 1 00
0067	LD 0010H 1 00
0068	LD 0010H 1 00
0069	LD 0010H 1 00
0070	LD 0010H 1 00
0071	LD 0010H 1 00
0072	LD 0010H 1 00
0073	LD 0010H 1 00
0074	LD 0010H 1 00
0075	LD 0010H 1 00
0076	LD 0010H 1 00
0077	LD 0010H 1 00
0078	LD 0010H 1 00
0079	LD 0010H 1 00
0080	LD 0010H 1 00
0081	LD 0010H 1 00
0082	LD 0010H 1 00
0083	LD 0010H 1 00
0084	LD 0010H 1 00
0085	LD 0010H 1 00
0086	LD 0010H 1 00
0087	LD 0010H 1 00
0088	LD 0010H 1 00
0089	LD 0010H 1 00
0090	LD 0010H 1 00
0091	LD 0010H 1 00
0092	LD 0010H 1 00
0093	LD 0010H 1 00
0094	LD 0010H 1 00
0095	LD 0010H 1 00
0096	LD 0010H 1 00
0097	LD 0010H 1 00
0098	LD 0010H 1 00
0099	LD 0010H 1 00
0100	LD 0010H 1 00
0101	LD 0010H 1 00
0102	LD 0010H 1 00
0103	LD 0010H 1 00
0104	LD 0010H 1 00
0105	LD 0010H 1 00
0106	LD 0010H 1 00
0107	LD 0010H 1 00
0108	LD 0010H 1 00
0109	LD 0010H 1 00
0110	LD 0010H 1 00
0111	LD 0010H 1 00
0112	LD 0010H 1 00
0113	LD 0010H 1 00
0114	LD 0010H 1 00
0115	LD 0010H 1 00
0116	LD 0010H 1 00
0117	LD 0010H 1 00
0118	LD 0010H 1 00
0119	LD 0010H 1 00
0120	LD 0010H 1 00
0121	LD 0010H 1 00
0122	LD 0010H 1 00
0123	LD 0010H 1 00
0124	LD 0010H 1 00
0125	LD 0010H 1 00
0126	LD 0010H 1 00
0127	LD 0010H 1 00
0128	LD 0010H 1 00
0129	LD 0010H 1 00
0130	LD 0010H 1 00
0131	LD 0010H 1 00
0132	LD 0010H 1 00
0133	LD 0010H 1 00
0134	LD 0010H 1 00
0135	LD 0010H 1 00
0136	LD 0010H 1 00
0137	LD 0010H 1 00
0138	LD 0010H 1 00
0139	LD 0010H 1 00
0140	LD 0010H 1 00
0141	LD 0010H 1 00
0142	LD 0010H 1 00
0143	LD 0010H 1 00
0144	LD 0010H 1 00
0145	LD 0010H 1 00
0146	LD 0010H 1 00
0147	LD 0010H 1 00
0148	LD 0010H 1 00
0149	LD 0010H 1 00
0150	LD 0010H 1 00
0151	LD 0010H 1 00
0152	LD 0010H 1 00
0153	LD 0010H 1 00
0154	LD 0010H 1 00
0155	LD 0010H 1 00
0156	LD 0010H 1 00
0157	LD 0010H 1 00
0158	LD 0010H 1 00
0159	LD 0010H 1 00
0160	LD 0010H 1 00
0161	LD 0010H 1 00
0162	LD 0010H 1 00
0163	LD 0010H 1 00
0164	LD 0010H 1 00
0165	LD 0010H 1 00
0166	LD 0010H 1 00
0167	LD 0010H 1 00
0168	LD 0010H 1 00
0169	LD 0010H 1 00
0170	LD 0010H 1 00
0171	LD 0010H 1 00
0172	LD 0010H 1 00
0173	LD 0010H 1 00
0174	LD 0010H 1 00
0175	LD 0010H 1 00
0176	LD 0010H 1 00
0177	LD 0010H 1 00
0178	LD 0010H 1 00
0179	LD 0010H 1 00
0180	LD 0010H 1 00
0181	LD 0010H 1 00
0182	LD 0010H 1 00
0183	LD 0010H 1 00
0184	LD 0010H 1 00
0185	LD 0010H 1 00
0186	LD 0010H 1 00
0187	LD 0010H 1 00
0188	LD 0010H 1 00
0189	LD 0010H 1 00
0190	LD 0010H 1 00
0191	LD 0010H 1 00
0192	LD 0010H 1 00
0193	LD 0010H 1 00
0194	LD 0010H 1 00
0195	LD 0010H 1 00
0196	LD 0010H 1 00
0197	LD 0010H 1 00
0198	LD 0010H 1 00
0199	LD 0010H 1 00
0200	LD 0010H 1 00
0201	LD 0010H 1 00
0202	LD 0010H 1 00
0203	LD 0010H 1 00
0204	LD 0010H 1 00
0205	LD 0010H 1 00
0206	LD 0010H 1 00
0207	LD 0010H 1 00
0208	LD 0010H 1 00
0209	LD 0010H 1 00
0210	LD 0010H 1 00
0211	LD 0010H 1 00
0212	LD 0010H 1 00
0213	LD 0010H 1 00
0214	LD 0010H 1 00
0215	LD 0010H 1 00
0216	LD 0010H 1 00
0217	LD 0010H 1 00
0218	LD 0010H 1 00
0219	LD 0010H 1 00
0220	LD 0010H 1 00
0221	LD 0010H 1 00
0222	LD 0010H 1 00
0223	LD 0010H 1 00
0224	LD 0010H 1 00
0225	LD 0010H 1 00
0226	LD 0010H 1 00
0227	LD 0010H 1 00
0228	LD 0010H 1 00
0229	LD 0010H 1 00
0230	LD 0010H 1 00
0231	LD 0010H 1 00
0232	LD 0010H 1 00
0233	LD 0010H 1 00
0234	LD 0010H 1 00
0235	LD 0010H 1 00
0236	LD 0010H 1 00
0237	LD 0010H 1 00
0238	LD 0010H 1 00
0239	LD 0010H 1 00
0240	LD 0010H 1 00
0241	LD 0010H 1 00
0242	LD 0010H 1 00
0243	LD 0010H 1 00
0244	LD 0010H 1 00
0245	LD 0010H 1 00
0246	LD 0010H 1 00
0247	LD 0010H 1 00
0248	LD 0010H 1 00
0249	LD 0010H 1 00
0250	LD 0010H 1 00
0251	LD 0010H 1 00
0252	LD 0010H 1 00
0253	LD 0010H 1 00
0254	LD 0010H 1 00
0255	LD 0010H 1 00
0256	LD 0010H 1 00
0257	LD 0010H 1 00
0258	LD 0010H 1 00
0259	LD 0010H 1 00
0260	LD 0010H 1 00
0261	LD 0010H 1 00
0262	LD 0010H 1 00
0263	LD 0010H 1 00
0264	LD 0010H 1 00
0265	LD 0010H 1 00
0266	LD 0010H 1 00
0267	LD 0010H 1 00
0268	LD 0010H 1 00
0269	LD 0010H 1 00
0270	LD 0010H 1 00
0271	LD 0010H 1 00
0272	LD 0010H 1 00
0273	LD 0010H 1 00
0274	LD 0010H 1 00
0275	LD 0010H 1 00
0276	LD 0010H 1 00
0277	LD 0010H 1 00
0278	LD 0010H 1 00
0279	LD 0010H 1 00
0280	LD 0010H 1 00
0281	LD 0010H 1 00
0282	LD 0010H 1 00
0283	LD 0010H 1 00
0284	LD 0010H 1 00
0285	LD 0010H 1 00
0286	LD 0010H 1 00
0287	LD 0010H 1 00
0288	LD 0010H 1 00
0289	LD 0010H 1 00
0290	LD 0010H 1 00
0291	LD 0010H 1 00
0292	LD 0010H 1 00
0293	LD 0010H 1 00
0294	LD 0010H 1 00
0295	LD 0010H 1 00
0296	LD 0010H 1 00
0297	LD 0010H 1 00
0298	LD 0010H 1 00
0299	LD 0010H 1 00
0300	LD 0010H 1 00
0301	LD 0010H 1 00
0302	LD 0010H 1 00
0303	LD 0010H 1 00
0304	LD 0010H 1 00
0305	LD 0010H 1 00
0306	LD 0010H 1 00
0307	LD 0010H 1 00
0308	LD 0010H 1 00
0309	LD 0010H 1 00
0310	LD 0010H 1 00
0311	LD 0010H 1 00
0312	LD 0010H 1 00
0313	LD 0010H 1 00
0314	LD 0010H 1 00
0315	LD 0010H 1 00
0316	LD 0010H 1 00
0317	LD 0010H 1 00
0318	LD 0010H 1 00
0319	LD 0010H 1 00
0320	LD 0010H 1 00
0321	LD 0010H 1 00
0322	LD 0010H 1 00
0323	LD 0010H 1 00
0324	LD 0010H 1 00
0325	LD 0010H 1 00
0326	LD 0010H 1 00
0327	LD 0010H 1 00
0328	LD 0010H 1 00
0329	LD 0010H 1 00
0330	LD 0010H 1 00
0331	LD 0010H 1 00
0332	LD 0010H 1 00
0333	LD 0010H 1 00
0334	LD 0010H 1 00
0335	LD 0010H 1 00
0336	LD 0010H 1 00
0337	LD 0010H 1 00
0338	LD 0010H 1 00
0339	LD 0010H 1 00
0340	LD 0010H 1 00
0341	LD 0010H 1 00
0342	LD 0010H 1 00
0343	LD 0010H 1 00
0344	LD 0010H 1 00
0345	LD 0010H 1 00
0346	LD 0010H 1 00
0347	LD 0010H 1 00
0348	LD 0010H 1 00
0349	LD 0010H 1 00
0350	LD 0010H 1 00
0351	LD 0010H 1 00
0352	LD 0010H 1 00
0353	LD 0010H 1 00
0354	LD 0010H 1 00
0355	LD 0010H 1 00
0356	LD 0010H 1 00
0357	LD 0010H 1 00
0358	LD 0010H 1 00
0359	LD 0010H 1 00
0360	LD 0010H 1 00
0361	LD 0010H 1 00
0362	LD 0010H 1 00
0363	LD 0010H 1 00
0364	LD 0010H 1 00
0365	LD 0010H 1 00
0366	LD 0010H 1 00
0367	LD 0010H 1 00
0368	LD 0010H 1 00
0369	LD 0010H 1 00
0370	LD 0010H 1 00
0371	LD 0010H 1 00
0372	LD 0010H 1 00
0373	LD 0010H 1 00
0374	LD 0010H 1 00
0375	LD 0010H 1 00
0376	LD 0010H 1 00
0377	LD 0010H 1 00
0378	LD

PERIPHERAL



AMSTRAD SPEECH SYNTHESIZER

Voice control with dk'tronics' speech synthesizer

Amstrad Speech Synthesizer

Providing your computer with a voice, the existing hardware from dk'tronics includes a full stereo sound system, complete with amplifier and two four-inch speakers.

The speech synthesizer interfaces with the console through the floppy disc port. From here a short lead connects to the stereo output socket found next to the parallel port.

Accompanying the hardware is 4K of software, the *Downs* (also behind three of the four modes in which the speech chip can access).

The main ROM chip is the SPECS speech chip, which is loaded with 59 discrete speech sounds called allophones, and five patterns of varying length.

Each spoken word is assembled from a combination of these phonemes. Mode 1, the direct mode, is used digitally, whereas the software provided.

Unique to each allophone is a one- or two- byte binary number. These are listed in the handbook provided with the

speech synthesizer.

Passed to the speech chip locations in the I/O memory map as data, these values look each allophone into the speech buffer for outputting as spoken words.

Simple messages like 'Press enter to start' could be programmed in this way. It could prove useful to assemble a library of frequently used messages and prompts, listing all the appropriate allophone codes.

Perhaps the main advantage of this method is that no discernible HIMEP is needed, as is the case to all the other modes.

Thinking of programs written by you which include some machine code sections, you may want to add speech using this direct mode may well use considerable editing of the memory locations used in the host program.

Mode 2, using the SPEED command still requires the allophones to be accessed digitally. The key, 1, can be found on the shifted @ key.

Firstly, load the software which is provided on cassette. The SPEED command is followed by your chosen allophone codes which will be output as speech as soon as the program reaches the line containing that command.

There is a restriction here to that the SPEED command is limited to a maximum of 30 parameters. It is recommended that this mode is more appropriate to controlling sound effects (because it will be the subject of a great deal of dubbing microphone superimposition).

Mode 3 is the test to speech conversion. Hence has the least of the system. With the software loaded and using the command words provided in the speech chip, you are able to convert written words directly into speech, without recourse to the cumbersome allophone codes.

The following example demonstrates the simplicity of the syntax used in this mode: 26 PRINT "Please Computing Weekly"

Iain R Murray
explains how you
can expand
your C64 to meet
your particular
needs

EXPANDING YOUR 64



The enormous expansion possibilities of the Commodore 64 make a very easy way to expand to run, transport, store, and to get the most from the machine.

As the 64's BASIC memory is virtually gone when the computer is switched off, a backing store is virtually essential. For home users, the usually cheapest form of magnetic storage unit, normally a cassette tape recorder or floppy disc drive.

Most 64 owners will also purchase the Commodore C2H 'loop-as-a-tape' tape recorder. This reliable and comparatively cheap and quiet device (at a £199.95, just over the 64's £100 limit) is adequate for most purposes, for saving small programs and data files, but compared with other tape storage systems it is very slow (loading 12K is just over ten minutes). This makes it rather a nuisance for moving large programs (as well as the increased expense of longer cassette tapes). Some speed increasing hardware and software is now available, but they improve and risk enough can obtain a disc drive.

The Commodore 1541 single floppy disc drive has all the usual advantages of a disc system over a cassette unit: the contents of a disc can easily be listed, programs are loaded for you (no wading of tapes), disc storage is roughly as economical as tape in terms of K stored per penny, and, the disc drive is much faster than the cassette unit. Again, compared with

other systems, the Commodore drive is rather slow (loading 12K is about 1 minute). This is because the drive is connected to the 64 by a serial bus, and hence data is passed one bit at a time along a wire, rather than one byte at a time along eight wires in the parallel data transmission system which is most common for disc drives. Despite these drawbacks, the facilities offered by a disc drive are a Godsend to anyone used to working with cassette tape.

Another piece of essential hardware for the businessman or serious programmer is a printer — Commodore offers a wide range, some plug in directly, others can be added with suitable interfaces. The cheapest Commodore offer is the 1520, a low-cost dot-matrix printer/plotter offering 14 characters per second (cps) on 4-inch wide paper at 20, 40 or 80 characters per line (cpl). Reverse video characters appear underlined, and bi-resolution graphics and re-extended 10x-spaced-down characters are also possible. The 1525 is a tractor feed dot matrix printer offering 30 cps on A4 sized paper (or smaller) at up to 40 cpl. Reverse characters appear on the screen, and various printing modes including over-defined graphics and double width are easily available.

A number of other printers are also available, the price depending on the speed and facilities offered. You could also buy a daisy-wheel type

letter-quality printer, but these are more expensive and are used rather more in the business. The printers can be used to let programs for a detailed study and, with the appropriate software, text and graphics output can also be dumped to the printer. They also are available to the businessman or home user for printing out letters, letters and other documents prepared on a word processor or other graphics-compatible software. Other printers, disc drives, etc. can be added to the 64, but there may require modified cables or specialised interfaces.

The 64's user port offers access to parallel input/output ports directly programmable from BASIC. Commodore produces a REL cartridge to allow the port to perform as a set of switches or connect to external devices (teletext, automatic appliances, etc). This allows you to control virtually anything with your humble memo. A number of home-build projects for various purposes have been published in the electronics press, and many also include measurements for control and monitoring applications.

You can see that the 64's expansion facilities make it much more than a number cruncher or games machine. Take a glance through the hardware adverts in a fine magazine, and you should find some interesting projects to further your experiment and use of your computer.

TAKE YOUR PICK

The choice is yours — take part in aerial combat, find your way out of a maze or pilot a space shuttle. Andrew Gardner's combination

Oric-maze

The task is to escape from a 3D maze.

The screen will show a top-down view of your position with the direction you can move in like view the screen gives faces in the direction you can move. If you can move forward you'll also be able to see the room directly ahead.

To find your way out you must try to build up a mental map of the maze you're in, or cheat by drawing one.

When you're losing the cut a terrible sign will appear, then you must simply move forward to freedom.

The program picks one out of a possible two mazes to add a little extra appeal.

The commands you can use are:

F or FORWARD
R or RIGHT
L or LEFT
B or BACK
Q or QUIT

When when typing in the DATA item be very careful. One mistake could cause a lot of frustration.

How it works

30 resolution bit graphics
40-70 game in a series of sub-routines
1000-1100 sets up variables, including the maze entry variable
1000-1100 series of decisions which set up the maze view
1000-1200 INPUT user movement of move variable, make adjustments to maze variable
1000-1100 maze completed routine
1000-1000 3D view draw routine for general maze
1000-1000 DATA for look ahead

Variables

A (X,Y) array variable to store maze data
B room
M maze automatically in front
D direction
L1/L2 variables used to draw maze for view of next room

Space shuttle lander

Lead the shuttle or face the consequences!

You control the shuttle by turning or lowering its nose, which causes a change in your descent rate. You can never gain height. Your nose level indicates how you to present level. Trying to move the nose to 0 results a stall and a catastrophic failure.

The aim is to reach zero height when you're just less than 1000 metres from the end of the runway. Attempting to land before causes a crash!

Screen colour shows the progress stage of the mission. As you change height you need higher nose levels to achieve similar descent rates.

On skill levels greater than 0 nose-wards becomes an added complication. You must try to keep your heading near to zero. Failure to do so reduces the run at which you approach the runway, sometimes making it impossible to land.

Use cursor arrows to control descender, and left arrow subtracts, while right arrow adds.

What you'll notice that your height is not clear less than the remaining distance. Use that as a rough guide.

How it works

30 resolution bit-graphics, 300 colours
100-170 all main loop equations, including heading change
100-1200 PLT0 instrument routine
100-100 read keyboard, make adjustments
100-110 series of nose loop checks
100-1000 PLT0 routine for landing approach
100-100 heading routine
100-1000 heading routine (PRINTs) screen, while the key
100-1000 make routine
100-1000 routine to PLT0 screen messages, adjust variables
1000-1000 PLT0 program
1000-1000 adjust skill level, on variation
1000-1100 on up user-defined graphics, PCL0 game title on entry line

Variables

B descent to end of runway
200 height
300 nose level
1000-1000 descent rate
A/V/H nose level (0% is PLT000 on screen)
100 heading
100 controlling descent rate
100 skill level
1000 game score

War plane

In this game you're the pilot of a fighter plane with cockpit view, and must shoot down the enemy in front by bringing it within your sights and firing. However, don't be too trigger-happy because you've a limited supply of laser bolts.

At the start you choose a time limit at which to destroy your ship.

Each time you destroy a fighter the score will be greater.

A constant reminder of remaining laser bolts, remaining time and your number of hits is given.

Use the cursor keys to move the enemy and the space bar to fire.

100-100 game in a series of sub-routines
1000-100 on up user-defined graphics
1000-1000 PCL00 game title on entry line
1000-1100 select time limit, hit variables
1000-1000 on up score
1000-1000 randomly moves enemy
1000-1100 read keyboard, make adjustments, PLT00 enemy
1000-1100 distance remaining routine, PLT000 screen update
1000-1000 series of checks
1000-1000 check hit on enemy
1000-1100 enemy hit routine
1000-1000 PLT00 keyroutines
1000-1000 on up destroyed routine
1000-1000 PRINT screen, end for a hit

Variables

T time remaining
100 remaining laser bolts
100 number of hits
A/V/H nose-and horizontal position of enemy
B-X-Y screen-and vertical position of enemy
M variable controlling speed of enemy
T game title as in PCL000 on entry line
J register controlling ability to fire
F register to check if 'War' key pressed
100 to score
100 score of player



MUSIC MAKER



Write or convert music for your Spectrum, or convert Dragon Ratings with this utility by Tony Houlton

The program simulates the Dragon PLAY command by allowing you to enter a string of letters and numbers which are then translated into the Spectrum BASIC equivalent.

The main variables are as follows: T — tempo, O — octave, L — note length and F — pitch length. Each letter is followed by a number, if you don't include them then the following default values are set by the computer:

T — roughly equivalent to 4/4 time, O — the octave below middle C, L — gives a note length equivalent to a 16 note duration. No default value is set for F, but the notes from the same duration as the note lengths e.g. D4 give a pulse equivalent to the duration of an eighth note. The notes are entered by using the letters A to G.

You can also modify notes by using the relevant symbols for sharp, flat and dotted notes etc.

The first part of the program describes the variables and their parameters and shows the normal musical notation and the program equivalent. It should be possible, with a little practice, to translate written music into the program code. The computer translates this into Spectrum BEEPs and displays them on the screen.

As each BEEP is calculated the note is sounded and the pitch and duration values displayed. The note is played at normal speed and the information redisplayed. You can then

copy the data as many times as you wish without losing the information. When you have copied the BEEP values for future use you can return to the screen to enter more music. You can have a printed copy by changing any PRINT command to two 1240 to 1249 to LPRINT. If you want a copy of your original string entry, then break into the program (CAPS SHIFT and BREAK) and enter the given addressing mode LPRINT as PRINT ALL.

To convert PLAY commands in Dragon Ratings you select the MUSIC MAKER option and enter the string in the bottom. The only command that are not found in this program will be the letter Y followed by a number. This controls the volume. There is no volume control on the Spectrum and so these are ignored.

The other sound command on the Dragon is SOUND. This plays a given note for a given duration and a short program (line 1240 onwards) to deal with this conversion has been included.

The only difficulty that will be encountered is that the Spectrum will not BEEP for longer than 10 seconds. If the second number after SOUND is larger than 100 then the value will be converted to 100 and you will have separate values SOUND 90,100 could be entered as SOUND90,100 + SOUND100,10 displayed as BEEP 90,10 BEEP 10,10. If you want to speed the program up by leaving out the BEEPs during the calculation then omit line 1070.

How it works

- 24-25 you CANI LOCK on, direct to program routine
- 26-28 MUSIC MAKER or SOUND selection routine
- 29-300 menu of instructions, variable routine
- 310-350 details of variables and parameters
- 360 input prompt for string of variables
- 370-400 set default values for T, O, L
- 410-450 menu loop to read input, allow exit at ALL to calculation
- 460-490 calculation of tempo
- 500-510 calculation of octave into values
- 520-530 calculation of note length
- 540-550 calculation of octave pitch values to note letters
- 560-580 calculation of pitch and duration, first year and round
- 590-610 calculation of power length
- 620-630 play note to control screen
- 640-650 last Spectrum BEEP values
- 660-680 play and fit again or return to menu
- 690-720 instructions for Dragon SOUND conversion
- 730-740 open of Dragon SOUND values
- 750-760 conversion octave times
- 770-780 display Spectrum output and play sound
- 790-800 options for another SOUND conversion or more to menu
- 810-820 graphics FORD (screen)
- 830-840 GATs values for graphics characters

Variables

- 45 array holding input variables
- T tempo
- O octave
- L note length
- F pitch length
- A to G note pitch values
- 90-100 number array holding pitch values
- 91 number array holding value
- E note number

```

* 18 CLS : POKE 23456,B: PRINT " MUSICMAKER AND DRAGON SOUND *****
***** COMPOSITION BY R.A.HOULTON *****
NOVEMBER 1988 *****"

15 GO SUB 1470
20 PRINT : PRINT " THE MUSICMAKER PROGRAMME IS SIMILAR IN FORMAT TO THE DRA
GON PLAY COMMAND."
30 PRINT : PRINT " A SHORT PROGRAMME TO CONVERT THE DRAGON SOUND COMMAND FOR
USING THE SPECTRUM IS ALSO INCLUDED"
40 PRINT : PRINT "PRESS "H" FOR MUSICMAKER OR "S" FOR DRAGON SOUND PROG
RAMS"
50 IF INKEY$="" THEN GO TO 50
60 IF INKEY$="H" THEN GO TO 1300
70 CLS : PRINT "THIS PROGRAM ALLOWS YOU TO COPY OR COMPOSE MUSIC FOR YOUR 16K
ORANGE SPECTRUM USING ALPHABETIC AND NUMERIC TERMS FOR THE NOTES,NOTE LENGTH, T
EMPO, OCTAVE AND PAUSES ETC." PRINT : PRINT "TO SEE THE VARIABLES AND THEIR P
ARAMETERS PRESS 1, ANY OTHER KEY TO WRITE MUSIC"
80 IF INKEY$="" THEN GO TO 80
90 IF INKEY$="1" THEN GO TO 340
140 CLS : PRINT TAB 4;"VARIABLES AND PARAMETERS": PRINT TAB 4;"*****
*****": PRINT "1. TEMPO": PRINT : PRINT "2. NOTE LENGTH": PRINT : PRI
NT "3. NOTES": PRINT : PRINT "4. OCTAVES": PRINT : PRINT "5. MODIFIERS": PRINT :
PRINT "6. PAUSES": PRINT : PRINT "7. TO WRITE A TUN": PRINT : PRINT "PLEASE SEL
E BY NUMBER"
150 IF INKEY$="" THEN GO TO 150
160 IF INKEY$="1" THEN GO TO 230
170 IF INKEY$="2" THEN GO TO 240
180 IF INKEY$="3" THEN GO TO 250
190 IF INKEY$="4" THEN GO TO 260
200 IF INKEY$="5" THEN GO TO 240
210 IF INKEY$="6" THEN GO TO 250
220 IF INKEY$="7" THEN GO TO 240
230 GO TO 150
230 CLS : PRINT "TEMPO": PRINT "*****": PRINT : PRINT "TEMPO IS INDICATED BY TH
E LETTER T FOLLOWED BY A NUMBER": PRINT "THE TEMPO IS THE SPEED AT WHICH
THE PIECE IS PLAYED. A VALUE BETWEEN 1 AND 10 WILL MEET MOST NEEDS." PRINT :
PRINT "2 IS A SPEED OF ONE BEAT FOR SECOND, 14 THE BEATS PER SECOND": PRINT :
PRINT "IF YOU DO NOT ENTER A VALUE FOR T THE COMPUTER WILL ALLOCATE THE VALUE T
3": PRINT : PRINT "PRESS ANY KEY TO RETURN TO MENU": PAUSE 5: GO TO 140
240 CLS : PRINT "NOTE LENGTH": PRINT "*****": PRINT : PRINT " NOTE LEN
GTH IS INDICATED BY L FOLLOWED BY A NUMBER": PRINT : PRINT "MOST NOTE LENGTHS WI
LL BE IN THE RANGE 1 TO 32": PRINT : PRINT "L1 IS A WHOLE NOTE, L2 A HALF NOTE
AND L4 A QUARTER NOTE": PRINT : PRINT "IF YOU DO NOT ENTER A VALUE FOR L THE COM
PUTER WILL ALLOCATE THE VALUE L4": PRINT : PRINT "L CAN BE MODIFIED BY C, E.G.
L2. = 1/2 + 1/4 NOTE = 3/4 NOTE": PRINT : PRINT "PRESS ANY KEY TO CONTINUE": PA
USE 5
240 CLS : PRINT AT 0,0;"NOTE LENGTH VALUES": AT 1,0;"*****": AT 4,10
;"C": AT 0,0;"L2 = L1": AT 0,10;"L2 = L2": AT 0,0;"L2 = L1": AT 0,10;"L2 = L1"
;"L
4": AT 0,10;"L2 = L1": AT 12,0;"L2": AT 12,10;"L2": AT 13,0;"L2 = L1": AT 13,10;"L2
=L1"
;"L2": AT 16,0;"PRESS ANY KEY TO RETURN TO MENU": PAUSE 5: GO TO 140
250 CLS : PRINT "NOTES": PRINT "*****": PRINT : PRINT "THE NOTES CAN BE REPRSE
NTED BY LETTERS AS SHOWN BELOW"
260 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
270 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
280 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
290 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
300 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
310 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
320 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
330 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
340 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
350 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
360 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
370 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
380 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
390 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
400 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
410 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
420 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
430 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
440 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
450 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
460 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
470 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
480 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
490 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
500 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
510 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
520 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
530 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
540 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
550 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
560 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
570 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
580 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
590 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
600 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
610 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
620 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
630 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
640 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
650 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
660 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
670 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
680 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
690 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
700 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
710 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
720 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
730 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
740 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
750 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
760 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
770 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
780 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
790 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
800 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
810 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
820 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
830 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
840 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
850 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
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960 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
970 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"
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990 PRINT AT 0,0;"C": AT 0,10;"D": AT 0,10;"E": AT 0,20;"F": AT 0,20;"G": AT 0,24;"A"

```







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1170 PRINT "PAUSE "PAUSE$": ":
1180 LET HHI:=0: LET JII:=PAUSE: LET K:=1
1190 RETURN
1200 FOR I=1 TO K-1
1210 IF HHI=0 THEN PAUSE JII: NEXT I
1220 REPEAT HHI,JII
1230 NEXT I
1240 CLS: PRINT: "TO INCLUDE YOUR TIME IN PROGRAM TYPE (LINE No) ":
1250 FOR I=1 TO K-1
1260 IF HHI=0 THEN PRINT "PAUSE "JII": ": "I: NEXT I
1270 PRINT "REPEAT "HHI":","JII":": ": "I
1280 NEXT I
1290 PRINT TAB 8;"PRESS "H" FOR RETURN TO MENU. PRESS "P" TO PLAY AGAIN AN
D LIST"
1300 IF INKEY="H" THEN GO TO 1380
1310 IF INKEY="P" THEN GO TO 140
1320 IF INKEY="R" THEN GO TO 1380
1330 GO TO 1380
1340 REM PROGRAM TO CONVERT THE DRAGON COMPUTER SOUND COMMAND TO SPECTRUM BEEPS.
BY R.A.HOULTONMARCH 1984 UPDATED NOVEMBER 1984
1350 CLS: PRINT: PRINT " THE DRAGON SOUND COMMAND IS VERY SIMILAR TO THE SP
ECTRUM BEEP COMMAND AND CAN BE COPIED BY THIS PROGRAM"
1360 PRINT "THE SOUND COMMAND HAS THE FORM": PRINT "SOUND P,D": PRINT:
PRINT "RANGE OF P 1-600 TO 255(HIGH)": PRINT "MIDDLE C = 700": PRINT: PRINT "
RANGE OF D 1(SHORT) TO 255(LONG)": PRINT "(1 SECOND = 16)": PRINT: PRINT "PLEAS
E ENTER P AND D"
1370 INPUT "P FIRST PLEASE "P: IF P<1 OR P>255 THEN GO TO 1370
1380 INPUT "AND NOW D "D: IF D<1 OR D>255 THEN GO TO 1380
1390 LET PITCH=INT (P/31-30): LET B=0: IF B>160 THEN LET B=160
1400 LET DURATION=INT ((D/61+100-0.0005)/1000)
1410 PRINT: PRINT "FROM SOUND "P";"D: PRINT: PRINT "USE BEEP "DURATION";"P
ITCH
1420 PRINT: PRINT "TO HEAR SOUND PRESS ANY KEY": PAUSE 0: BEEP DURATION,PITCH
1430 PRINT: PRINT "FOR ANOTHER SOUND PRESS S": PRINT: PRINT "ANY OTHER KEY TO
RETURN TO MENU"
1440 IF INKEY="S" THEN GO TO 1440
1450 IF INKEY="H" OR INKEY="P" THEN GO TO 1350
1460 RESTORE 1320: GO TO 10
1470 FOR I=USER "A" TO USER "F"+7
1480 READ A: POKE I,A
1490 NEXT I
1500 DATA 0,60,60,120,120,60,60,0
1510 DATA 1,60,67,120,120,60,60,0
1520 DATA 1,1,1,1,1,1,1
1530 DATA 1,61,120,200,200,120,60,0
1540 DATA 120,64,32,16,8,0,0,0
1550 DATA 120,64,32,144,64,32,16,0
1560 DATA 120,64,32,144,64,32,144,64
1570 DATA 32,16,8,0,0,0,0,0
1580 DATA 0,0,255,60,60,0,0,0
1590 DATA 0,0,60,60,255,0,0,0
1600 DATA 00,00,00,4,0,0,0,0
1610 DATA 0,10,10,10,10,32,32,32
1620 DATA 00,00,00,4,110,120,120,0
1630 DATA 232,240,240,16,16,32,32,32
1640 DATA 64,32,16,0,4,0,10,00
1650 DATA 60,240,112,32,112,240,255,132
1660 RETURN
1665 REM (Enter lines 1660 and 1700 in ordinary capitals
and 1710 in graphics(CAP SHIFT)+(P),)
1670 REM GRAPHICS CHARACTERS
1680 REM A B C D E F G H I J K L
1690 REM M N O P Q R S T U V W X Y Z
1700 REM H R O P
1710 REM G B G
Type USE "B" as B J

```



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FAME GAME

If you've ever had a brilliant idea for a game, but haven't got the programming skills to make it reality, then you could now be in with a chance to see your creation on screen, in our game developer competition.

That will be 110 winners who will all receive prizes from Systems 3 Software. The top 10 winners will receive three games: *Jeopardy*, *Monopoly* and *Scrabble*, all for the C64. The 100 runners up will get *Scrabble* or *Jeopardy*. *Scrabble* is the \$29.95 version; the *Jeopardy* is the \$24.95 version. In addition all entries will be considered by Systems 3 for possible development into commercial software.

To start, just send us your idea for an arcade game or an adventure. You can choose your own characters and settings and have your idea on any theme you like. Try and make it as original as possible. It can be funny, hair raising or just plain exciting but it must have the potential to be transformed into a really addictive game.

Explain your idea, in no more than 300 words — typed if possible — and give as much detail as you can. We would also like to see your idea illustrated on a story board. Don't worry if you're not very artistic, all we need are some basic pictures of your screen scenes and characters.

The comparison will be limited by System 3 Software and copyright in all cases will pass to System 3 and Argus. Operative Publications System 3 Software will have the option in developing any of the future, non-commercial software and will ensure any provision with the

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Age Group	Total (%)	Male (%)	Female (%)	Unknown (%)
18-24	12.5	13.2	11.8	12.0
25-34	28.3	29.1	27.5	28.0
35-44	21.7	22.5	20.9	21.5
45-54	18.9	19.8	18.0	19.0
55-64	14.2	15.1	13.3	14.5
65+	3.4	3.3	3.5	3.5

When you've thought of your game idea explain it in as much detail as possible but in not more than 300 words. If you can type, then please send your entry typed. If not make sure your handwriting is very clear and neat.

If you decide to illustrate your essay then make sure your diagrams are very clear. They need not be works of art, just easily drawn diagrams. You can also include ideas for colour and sound. It is not essential to use illustrations but it would be very helpful to the reader.

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